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**AN EXPLORATORY STUDY
IN THE CONSTRUCTION INDUSTRY ON THE EFFORTS
BEING TAKEN TO MINIMIZE CONTACT WITH
OVERHEAD POWER LINES**

By

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LT, CEC, USN**

A research paper submitted
in the partial fulfillment of the requirements
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Date _____

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ABSTRACT

This report provides the results of a study to explore what efforts are being taken to minimize construction worker/equipment contact with overhead power lines located in the vicinity of construction projects. Three different sample groups were studied: contractors, utilities, and municipalities. Questionnaires were sent to each sample group and the responses were analyzed separately for each group. Some of the results of this study include common precautions practiced by contractors, actions taken most often by utilities, and requirements that municipalities include in their contract documents to provide worker/equipment protection from contact with overhead power lines.

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CHAPTER 1

INTRODUCTION

Construction is dangerous work. Many fatalities along with many serious injuries occur each year in the construction industry. According to Occupational Safety and Health Administration's (OSHA) Analysis of Construction Fatalities 1985-1989 [1], three different organizations report comparable data regarding the number of fatalities occurring each year. These organizations are: the National Institute for Occupational Safety and Health (NIOSH), the Bureau of Labor Statistics (BLS), and OSHA. The above organizations each reported approximately 800 construction workers died in 1988. On the other hand, the National Safety Council (NSC) reports considerably higher number of fatalities. NSC's data indicates that 2200 fatalities occurred in that same year. Although the various organizations may offer different statistics regarding the number of fatalities each year, all the organizations have at least one common finding: construction worker fatalities are too high and remedial action must be taken to reduce the number of these accidents.

Using the data published by OSHA [1], 3496 construction fatalities were investigated by OSHA from the years 1985 through 1989. Seventeen percent, approximately 595 of the 3496 construction fatalities, were caused by electrocution. Of the 595 fatalities 65 percent, or roughly 387, were due to electric shock caused by contact with overhead power lines and of these (387), 205 involved overhead power line contact with construction equipment.

The top four leading causes of work related death from injury are motor vehicles, homicide, industrial equipment, and falls. The fifth leading cause is electrocutions [4]. Electrocutions are among the most frequently reoccurring accidents in the construction industry [2]. The purpose of this study is to ascertain the level of effort being taken in the construction industry to minimize contact with overhead power lines to prevent electrocutions. The importance

of this study is threefold: (1) It will determine what kinds of practices are most commonly used at construction sites, (2) It will give an indication of who is generally considered the responsible party to prevent contact with overhead power lines, e.g., the contractor, utility, or the owner, and (3) It will determine how active a role the local utilities play in preventing contact with overhead lines by contractors. The objective of this study is to provide information whereby companies or organizations can alter or modify their approaches to overhead power line safety, hopefully to the point that lives are saved.

This study consisted of four separate stages. The first stage was a literature review and the second stage was the data gathering. Data gathering entailed developing and mailing three separate groupings of questionnaires. Municipalities, utilities, and contractors were chosen as the sample populations. Compiling and analyzing the responses was the third stage. The fourth and final stage was presenting the conclusions and recommendations relevant to the analysis. All of these stages will be discussed in detail in the following chapters.

CHAPTER 2

BACKGROUND

2.1 INTRODUCTION

This chapter will present information concerning overhead power line electrocutions in the construction industry. Specifically reviewed will be information on existing regulatory standards and precautions, along with a review of the related literature.

2.2 EXISTING STANDARDS AND PRECAUTIONS

Specific requirements for cranes, derricks, hoists, elevators, and conveyors involving minimum clearances that must be maintained while operating near overhead power lines are contained in OSHA's Safety and Health Regulations for Construction, Subpart N (29 CFR 1926.550 (a)(15)). Two general safe guards are recognized by the OSHA standard. One relates to de-energizing the overhead lines and the other relates to installing insulating barriers. When electrical distribution and power lines have not been de-energized and grounded, or there are no insulating barriers to separate lines from the equipment in use that prevents physical contact, the equipment must be operated only in accordance with the following minimum clearances (paraphrased below):

(1) Any part of the crane or load must be a least ten feet from overhead power lines that are rated 50 kV or below.

(2) Ten feet plus .4 inch for each 1 kV over 50 kV or twice the length of the line insulator. However, in no circumstances shall this distance be less than ten feet.

(3) For equipment in transit with no load and having its boom fully lowered, the minimum clearance is four feet for overhead lines 50 kV and less; ten feet for lines over 50 kV and up to 345

kV, and for overhead lines beyond 345 and up to 750 kV the minimum clearance must be sixteen feet.

In addition, the operation must have a person designated to observe clearances and communicate with the operator where it is difficult for the operator to visually maintain clearances. All overhead lines must be considered energized unless it has been visibly grounded and the owner or utility has stated the line is de-energized. Protection devices such as insulating links, cage-type boom guards, and proximity warning devices may be used, however, using such items does not waive any requirements of this regulation. Also, if work is near transmitter towers where an electrical charge can be induced, tests shall be made to determine if a charge can be induced on the equipment or the transmitter must be de-energized. Additional precautions to dissipate induced voltages include: providing an electrical ground directly to the upper rotating structure supporting the boom, ground jumper cables shall be attached to material when an electrical charge is induced, crews shall use non conductive poles to attach the ground cable to the load, and no combustible or flammable materials shall be in the immediate areas during operations.

Although not specifically defined in 29 CFR 1926.550 (a)(15), a signal person is necessary whenever the boom, load, or load lines are approaching the "limit of approach" [2,3]. The "limit of approach" is defined as the area around every live power line where it is strictly prohibited to move any part of the equipment into that area unless the lines have been de-energized or insulated. The "limit of approach" is similar to the minimum clearances that have been previously defined in 29 CFR 1926.550 (a)(15). For example, as described in *Rigging for Commercial Construction* [3], if a crane has a 200 foot boom and is located 180 feet from a power line then a signal person is necessary. On the other hand, if the same crane is located 210 feet from the power line, then a signal person is not necessary.

Specific to Washington state, Washington Administrative Code (WAC) Chapter 296-155-428, Part I additionally requires warning signs to be posted. A warning sign legible at twelve feet

must be posted and maintained in plain view of the operator that is at the controls of any equipment capable of vertical, lateral, or swinging motion. The warning (for equipment operators) must state "It is unlawful to operate this equipment within ten feet of electrical conductors" and similar signs must also be posted on the outside of equipment to warn other persons (other than operators) working near the operation.

For an added degree of safety, the *Crane Handbook* and *Rigging for Commercial Construction* suggests other precautions that should be implemented while working around overhead power lines [2,3]:

- (1) Slow down the operating cycle of a machine: reduce hoisting, booming, swinging, and traveling speeds.
- (2) Ensure warning signs are posted (similar to Washington state's requirement).
- (3) Treat all lines as energized until proven otherwise.
- (4) The operator must pay close attention to the signal person at all times.
- (5) Use tag lines only when necessary. Do not use manila or nylon for they both retain moisture and conduct electricity. Polypropylene is the best rope to use as tag lines.
- (6) Keep all operations as far from the overhead lines as possible. Avoid loading, unloading, or stockpiling materials near overhead power lines.
- (7) Keep all access roads and ramps as far away as possible from the overhead lines.
- (8) Plan ahead. If possible, relocate the lines or at least have the lines insulated prior to any work commencing in the area.
- (9) Take extra precautions when traveling on uneven ground. Excessive bouncing of the boom may cause accidental contact with overhead power lines.
- (10) Beware of overhead lines with long spans. These lines tend to sway in the wind and cause accidental contact with the crane.
- (11) For cranes working in a relatively fixed position near overhead power lines, ensure the crane is electrically grounded with a ground rod, permanent grounding bus, or ground mat.

(12) A route should be plainly marked and "rider poles" [3] erected on each side of the crossing approach to ensure the crane structure is lowered to a safe position when repeatedly crossing under power lines.

2.3. LITERATURE REVIEW

A study was completed by Anthony Suruda [4] that examined the factors involved in electrocutions at the workplace to analyze the circumstances of injury and to suggest methods to prevent such injuries.

Suruda analyzed OSHA, Mine Safety and Health Administration (MSHA), Michigan OSHA, California Department of Industrial Relations, and Washington State Department of Labor and Industries fatality reports for the years of 1984 through 1986. (The OSHA Integrated Management Information Systems (IMIS) database only contains information for forty-seven states; Michigan, Washington, and California are not included in the database) From the sources, a total of 944 electrocutions occurred during this period. Approximately 475 of the electrocutions were from contact with high voltage power lines but of these, 335 (71 percent) were not directly involved in electrical work. While professions that do electrical work (power line contractors, electricians, and electric utilities) had high rates of electrocutions, many construction trades such as painters, roofers, and steel erectors also had high rates. In fact, steel erectors exceeded the electrocution rate of all electrical trades. (Electrocution rate was determined as the number of electrocutions per 100,000 workers. Power line contractors had a rate of 12.69 and steel erectors had the highest rate of 13.69). Two-thirds of the electrocutions involved heavy equipment: cranes, backhoes, concrete pump trucks, drilling rigs, boom trucks etc. One-third of the electrocutions resulted from conductive items carried or held onto by workers: scaffolds, ladders, concrete floats, metal pipes, etc.

Of the reports analyzed by Suruda, few mentioned the use of a signal person and not one report ever mentioned that an attempt was made to have the utility company disconnect power at the site.

Suruda further concluded that the best prevention for overhead power line electrocutions seems to be putting the lines underground, which is a common practice in many larger cities. Of the 335 power line electrocutions only four electrocutions were from underground lines, while the remaining were the result of overhead power lines. He also recommended that further studies should be conducted to determine how difficult and expensive it is for contractors to have utilities disconnect power line service at the site. Further studies may uncover why disconnecting power line service seems to be done so infrequently. Furthermore, Suruda suggested that improving the quality of information about occupational injury would allow more effective safety research. The basis of solving a problem is first knowing the magnitude of the danger.

Several pieces of literature [2,8] indicated that cranes equipped with known safety devices, such as insulating links, proximity warning devices, and insulated boom cages have serious limitations. The operator may be inclined to have a feeling of false security, and these devices have not been proven entirely reliable because the effectiveness of the safety devices depend on the angle between the boom and power line, and the strength of field around the power line [8]. A study conducted by G. G. Karady [5] analyzed the protection value of an insulating link. The current flowing through the body of a crane worker was compared with and without an insulating link. The study concluded that although not perfect, the insulating link significantly increases the safety of the crane operation. Results show that using the insulating link under "clean" conditions reduces the current to the harmless "let-go" level and adequately protects workers. The use of the insulating link under polluted and wet conditions (more likely similar to the conditions of a construction site) increases the steady state current above the let-go level but under the potentially fatal heart fibrillation level. Karady also stated that insulated rubber-sole shoes produce further

current reduction. However, insulated rubber-sole shoes should only be used as additional protection and not as primary protection.

Thirteen crane failure modes were studied by MacCollum in 1980 [6], to determine improvements to overcome critical hazards that had not been effectively controlled by work-practice rules. MacCollum sampled a number of crane accidents and quickly concluded that "operator error" was listed as the primary cause while "defective design" was completely overlooked. MacCollum defined defective design as including "neglect of human factor considerations and foreseeable field use in a variety of environments." According to MacCollum, there are seven basic reasons why people accommodate hazards. The reasons are:

1. They are unaware of the hazard.
2. They are unable to evaluate the possibility of accident risk.
3. They work under competitive peer or production circumstances.
4. They work with machines which have incompatible controls, conflicting instructions, lack guarding, or lack warning.
5. They work with machines which exceed human performance.
6. They work with machines which create distraction (such as noise) or have visual obstructions.
7. They work under stressful environmental conditions.

In order to reduce crane accidents, equipment must be designed to take into consideration and compensate for the foreseeable human errors that may occur. This appears to be what MacCollum refers to as part of the system approach to safety.

In his opinion, overhead power line contact is by far the most serious of all crane accidents. MacCollum stated it is essential that the system approach to safety is everyone's concern. Crane operators, riggers, utilities, contractors, and crane manufacturers all need to take an active role in safety. Courts are recognizing that everyone has a responsibility in regards to safety. There have

been a number of court cases concerning the need for such safety devices (insulating links, proximity warning devices, and insulating boom cages) and it appears crane manufacturers are being held liable to a greater degree than in the past. (An interesting note, literature was specifically reviewed from a tower crane manufacturer and there was no mention of any type of safety devices regarding protection from contact with overhead power lines). Figure 1 is a diagram that MacCollum provided in his paper. This diagram illustrates MacCollum's system safety approach to providing a higher degree of safety for preventing electrocutions.

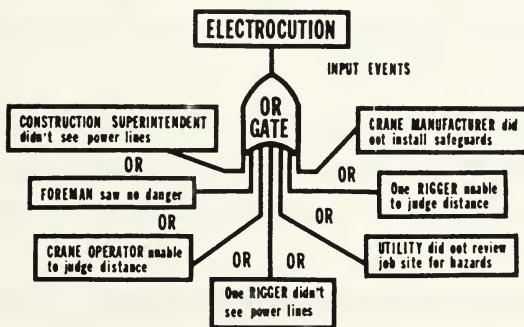
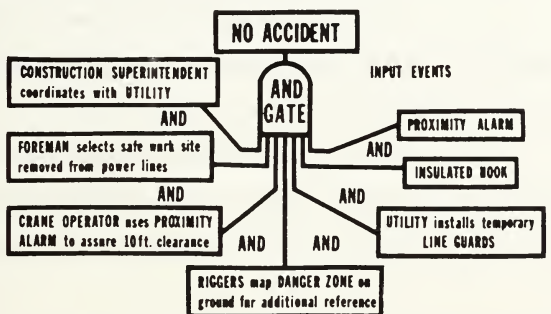


Figure 1.
MacCollum's System Safety Approach
for Preventing Electrocutions [6].

NIOSH also has investigated worker electrocutions and this information is summarized in a "NIOSH ALERT" entitled "Request For Assistance in Preventing Electrocutions from Contact Between Cranes and Power Lines" [7]. Five accidents resulting in six electrocutions involving crane and overhead power line contact were investigated. The five cases are briefly described below:

Case 1: A steel ladder was being moved by a telescoping boom crane while the construction worker was holding on to the ladder. As the boom swung, the cable came into contact with a 7,200 volt power line and electrocuted the worker.

Case 2: A telescoping boom crane was being used to move a steel framing member for a commercial shed. The load came into contact with a 23,000 volt overhead power line and two of the three workers who were in direct contact with the load were electrocuted.

Case 3: Roof materials were being stored directly under a 7,200 volt power line. A worker was electrocuted while hooking the load to the crane as the hoisting cable contacted a power line.

Case 4: A workman was placing timber underneath a crane's outrigger pads when the boom came into contact with a 3 phase 13,000 volt overhead power line while being extended for the next lift to place a section of concrete water pipe. The worker was electrocuted while touching the outrigger.

Case 5: A boom crane was moving a 4'x8' wood and metal form into place. A carpenter was holding onto the form and guiding it into place when the boom or cable came into contact with a 34,000 volt power line. The carpenter was electrocuted.

The objectives of the NIOSH investigations were to identify those factors which enabled the fatalities to occur and how they could have been prevented. NIOSH concluded that full compliance with 29 CFR 1926.550 (a)(15) and the additional safe work practices recommended by The Construction Safety Association of Ontario, Canada (CSA-Ontario), which are using non-

conductive taglines to guide loads and wearing insulating personal protective equipment, would have prevented each fatality [7]. Only one of the OSHA standards and CSA-Ontario recommended work practices was in compliance: not storing combustible materials directly beneath power lines. The cases that demonstrated compliance with not storing combustible materials directly beneath power lines were case numbers 2, 4, and 5.

Also reviewed were several articles regarding operator certification. One article by Robert Eckhardt [9] stated that the first step of a uniform program for all lifting devices is operator certification. OSHA regulations are vague for operator certification and training. Two good sources for a well defined operator qualification program can be found in *ANSI/ASME B30 Series* and the *CMAA Operator's Manual*. In the article "Crane certification aims at operator skills" [10], the author states that the Specialized Carriers of Rigging Association plans to start a national crane operator certification program. This program was initiated following a two year investigation that concluded there is currently no assurance to employers that operators have the general skills to provide a safe and competent operation. Although it is realized that this program will not completely eliminate accidents, it will provide employers the assurance that operators have a certain minimum required skill. Another article in *ENR* [11], describes briefly how the city of New Orleans initiated a city ordinance that would require a \$250 fee for every tower crane that will be operated on a construction site in Orleans Parish, require crane operators to be licensed by the city, and the city inspectors would have greater inspection power over use and maintenance of cranes. Ironically, members of the construction industry who worked with the city to develop the ordinance convinced the city council to vote against the ordinance. The code was never implemented.

One last interesting statement regarding crane safety standards for overhead power lines came from Delaine Nelson, the past president of the National Utility Contractors Association (NUCA). She stated [12] that it is impractical to expect contractors to reroute overhead power

lines or have the utility de-energize the lines and disrupt power to residences, businesses, and public services. She further stated that insulating the lines with rubber goods is adequate protection for excavators, loaders, or backhoes that are used near overhead power lines.

CHAPTER 3

RESEARCH METHODOLOGY

3.1. INTRODUCTION

This study was conducted in order to solicit information on efforts being taken in the construction industry to minimize construction worker contact with overhead power lines. The goal of this research was to determine what common and or unique safety practices exist when construction activity is performed under or near the vicinity of overhead power lines. The research was not intended to determine the most effective measures of reducing the risks posed by overhead power lines. It was intended that the results of this research could be shared with all interested organizations relating to and having involvement with the construction industry. The research was conducted in four stages: literature review, questionnaire development, data collection, and data analysis. The following paragraphs will describe each stage in further detail.

3.2. LITERATURE REVIEW

A literature review was conducted to seek information as to what regulations have been promulgated and what practices have been employed to minimize overhead power line risks to construction workers. Also, the review provided statistical information regarding electrocutions resulting from construction worker contact with overhead power lines and some general recommendations concerning the safety of crane operations. No specific information was found addressing owner or utility company involvement. (Refer to Chapter 2 for complete literature review).

3.3. QUESTIONNAIRE DEVELOPMENT

The first stage of the questionnaire development was to determine what type of organizations would be chosen to be surveyed. The criteria for the organizations to be sampled were: (1) having a high probability of having experience with construction workers working near the vicinity of overhead power lines (while not actually working on the power lines themselves), (2) having the necessary authority or control over personnel working near overhead power lines, (3) having the necessary authority to take specific action to minimize risk of overhead power line hazards, and (4) being included in available address lists. In following the above four criterion (satisfying criteria 1, 2, or 3, and criteria 4), three separate groupings of organizations were selected: utilities, municipalities, and contractors.

Utilities were selected on the basis of their possible influence in the community as far as educating owners, contractors, and the general public about the hazards posed by overhead power lines. Also, utilities were most likely the responsible party for rerouting or de-energizing the power lines upon request.

In order to see if there were any unique or separate regulations/codes other than federal or state regulations, municipalities were selected as the second group of organization to be surveyed. Municipalities were also considered for the owners portion of the survey sample. The researcher believed that municipalities could have a direct impact on the hazards posed by overhead power lines by stipulating special requirements in the plans and specifications to which contractors must adhere to when construction activity is performed near the vicinity of overhead power lines. Furthermore, sampling municipalities may provide some insight as to how much responsibility owners assume compared to how much responsibility is placed on the contractors regarding overhead power line safety.

The third type of organization to be sampled was contractors. Contractors are most directly affected by overhead power lines in terms of safety for personnel. Most safety standards/requirements are designed specifically to protect the contractor's employees . Contractors alone ultimately have the greatest impact on personnel working around and near overhead power lines, i.e., to what extent beyond the minimum requirements will a contractor go to ensure the safety of workers at a project site. Contractors would be the best group to provide information on the most common and unique safety practices that are currently implemented at project sites when overhead power lines are present.

After establishing the groups to be surveyed, the next step was to create the questionnaires that were to be mailed. With three distinct audiences for the questionnaires, three distinct questionnaires were developed: a separate questionnaire for contractors, a separate questionnaire for municipalities, and a separate questionnaire for utilities. Each questionnaire was designed to be short, concise and to the point. All three questionnaires were specifically limited to one single side of an 8 1/2" by 11" sheet of paper. Also, whenever feasible, the questionnaires were developed to have "yes", "no", and "check all that apply" type questions. Without being overly simplistic, it was believed that the above type of questionnaires would have the greatest response return rate.

The utility questionnaire specifically addressed the issues regarding the number of inquiries (concerning overhead power lines) received each year, the percentage of time action was taken as a result of the inquiries, the method of cost recovery, and the methods and or programs implemented regarding overhead power line awareness.

Directed more towards owners of projects, the municipality questionnaire addressed the issues of what type of contract requirements are incorporated into the plans and specifications, and how the responsibility is normally allocated when dealing with project site safety. Also, the

question was asked whether municipalities have any special or additional codes, regulations, or ordinances other than state and federal that address safety when working under or near overhead power lines.

The contractor questionnaire addressed what has been contractually required of contractors and what type of requirements are self imposed when working near overhead power lines. Also, a scenario was presented in which the contractor respondents were asked to describe in their own words what type of actions have been taken to minimize risks associated with overhead power lines.

The three separate questionnaires along with their respective cover letters are contained in Appendix A.

3.4. DATA COLLECTION

Following the questionnaire development, the next step was to determine exactly where the questionnaires would be sent. To determine where the questionnaires would be sent, specific company names and addresses were required.

Forty-nine (49) names and addresses of utilities were obtained from Jim Hinze. These utilities were actual respondents from a previous survey conducted by a graduate student under the guidance of Jim Hinze. By using the respondents from a different previous survey, it was believed a greater return of the questionnaires could be expected. (Eleven of the seventeen respondents were respondents from the previous survey). An additional fifty-one (51) names and addresses of utilities were obtained from the *Directory of Electric Utilities* [13]. The additional utilities were chosen using the following guidelines: companies that represented differing areas of

the United States, companies that were investor-owned, and companies that had a Safety Administrator or Director listed as one of the key personnel. See Appendix B for utility addresses.

The survey sample for municipalities was chosen in a similar fashion as to how the utilities were chosen. Forty-three (43) municipalities and their addresses were again provided by Jim Hinze. These municipalities were the same sample that were used in a different previous study. In addition to the forty-three (43) municipalities that were provided by Jim Hinze, another fifty (50) municipalities were selected using the *Municipal Executive Directory* [14]. The guidelines used for these selections were that the municipalities consisted of a variety of cities throughout the United States that they had a population larger than 50,000. See Appendix C for municipality addresses.

The contractor survey sample was obtained from the ENR Top 400 Contractors published by *Engineering News Record* [15]. From the 400 published list of contractors, the top 200 contractors were originally selected as the sample size. However, because to some difficulty in obtaining addresses only 184 questionnaires were mailed. The addresses for the 184 contractors that were selected were obtained via *Engineering News Record* , "Directory of Contractors" [16,17,18,19]. See Appendix D for contractor addresses.

A total of 377 questionnaires were mailed: 100 utilities, 93 municipalities, and 184 contractors. General data regarding the number of questionnaires mailed and returned is presented in Table 1.

3.5. DATA ANALYSIS

The returned questionnaires were separated into their respective groupings. Each group of questionnaires were presented on an unique color: contractors - gray, municipalities - yellow, and

utilities - white. This color scheme allowed easy sorting of the returned questionnaires. Each group of questionnaires were analyzed independently of the other groups. The results of all questions were tabulated in order to provide a simpler means of analysis. Large quantities of written responses were condensed into similar groupings and also presented in tabular form. Last, additional information that was returned along with the questionnaires was reviewed. Rigorous statistical analysis was not performed on the data as this was not consistent with the research objectives. The primary purpose of the analysis was identify the most common means of providing for construction worker safety when working near overhead power lines and to identify any unique practices that may warrant broader use.

Table 1- General data regarding questionnaires.

Organization	Questionnaires Mailed	Questionnaires Returned	Percent Returned ^a
Utilities	100 ^b	17	17%
Municipalities	93	41	44%
Contractors	184 ^c	55	30%
Total	377	113	30%

^a Rounded to nearest whole number.

^b One questionnaire returned as unable to deliver.

^c Six questionnaires returned as unable to deliver.

CHAPTER 4

UTILITY RESPONSES

One hundred utility questionnaires were mailed out and seventeen responses were received. Five of the responses were from the western region of the United States, ten responses were from central region of the United States, one response came from eastern the portion of the United States, and one response was unknown.

Of the seventeen utility respondents, the average number of inquiries per year that utilities received regarding overhead power line safety were approximately thirty. The number of times specific action was taken by utilities as a direct result from the inquiries received averaged a little over 50 percent. Table 2 lists each utility questionnaire that was received and shows the corresponding number of inquiries received per year and percent of time action is taken as a result of the inquiries. Answers that were not in numerical form were excluded from the mean and median calculations along with the extreme high response of 28,000 inquiries per year (280 times greater than the next highest response of 100).

Table 3 shows the summary of the types of action normally taken by utilities. The respondents stated that insulating the lines with rubber goods and rerouting the overhead power lines were the two most common types of action taken in order to reduce the risks posed by overhead power lines. These responses were given 59 percent and 56 percent of the time, respectively. The next most common type of action was to disconnect the lines during the construction work and the least common type of action provided by the utility is to bury the lines. Not one response indicated that burying lines had ever been done as a means of reducing the hazards posed by overhead lines. However, one respondent did say that lines had been buried when it was a permanent part of the job (a specific job requirement addressed in the contract

Table 2 - Actual Responses to: How many inquiries received per year and the percent of time action is taken as a result of the inquiries concerning overhead power lines in the vicinity of construction sites?

Questionnaire Received	Inquiries per Year	Percent of Time Specific Action is Taken
(a)	1-2	50%
(b)	1-2	-
(c)	3-5	100%
(d)	5	50%
(e)	10	40%
(f)	10	75%
(g)	10	50%
(h)	15	5%
(i)	25-30	95%
(j)	25-50	90%
(k)	50	10%
(l)	50	15%
(m)	75-100	10%
(n)	100+	65%
(o)	28,000	1%
(p)	"Fairly Often"	"Fairly Often"
(q)	NA	NA
	Mean = 29.3 **Median = 12.5	*Mean = 50.4% ***Median = 50%

* Number of questionnaires returned = 17

** Questionnaires (o), (p), and (q) are not included. Where a range is given, the midpoint was used to determine the overall mean.

*** Questionnaires (b), (o), (p), and (q) are not included.

Table 3 - Summary of Responses to: "What type of action is most commonly taken?"

Type of Action	Number of Responses	Percent of Total Responses
Reroute power lines overhead	9	53%
Disconnect power lines during construction work	7	41%
Bury the power lines	0	0%
Other: (specific action provided by respondents)		
• Insulate with rubber goods	10	59%
• Instruct contractor to maintain proper clearance	2	12%
• Use of barrier tape	2	12%
• Guard structures	2	12%
• Disconnect or de-energize a piece of line	2	12%
• "Non-reclose"	1	6%
• "Visually warn"	1	6%
• "High voltage demonstration"	1	6%
• "Ground"	1	6%
• Temporarily remove line	1	6%
• Utility worker on site	1	6%
• "Discuss scope of job and establish work methods with construction supervisor"	1	6%

*Number of Questionnaires returned = 17 (some respondents gave more than one response)

documents). "Other" responses by the respondents were sometimes very similar to the printed options contained on the questionnaire. For example, two "other" responses were to disconnect or de-energize a piece of the line; this is very similar to "disconnect power lines during construction work." Similar to "reroute power lines overhead," one respondent answered with "temporarily remove the line." "Guarding the structures", "using barrier tape for warning", and "instructing the contractor about maintaining proper clearances" were some other common actions that were provided by the respondents. "Non-reclose" was given by one utility along with the following explanation. At the substation there is a time sensing device that de-energizes the line when a fault occurs. After about six seconds the device re-energizes or "recloses" the line. "Non-reclose" is referred to as meaning the device is deactivated and if a fault occurs the line stays de-energized until it is manually reactivated.

In order to determine whether or not the type of action taken by the utility had a direct correlation with the cost to perform such action, the next question on the survey dealt directly with how costs are typically recovered when action is taken. As seen in Table 4, seventy-one percent of the respondents stated that all costs are reimbursable. The job or task is performed and then the actual costs are billed to the customer, either the owner of the project or the contractor. Only one respondent indicated a flat fee procedure was used (this respondent also included "reimbursable" and "other" as methods of recovering costs). Five respondents stated that there is no charge, however, most also concurred that the "no charge" actually depends on how much work is involved and the specific type of contract. For example, one respondent stated there is no charge for insulating the primary lines with rubber goods, on the other hand, if extensive line work is required costs are reimbursable. "Estimated cost" was given as one response and this was interpreted to mean that a price to do the job was quoted to the customer and that this was the price paid, regardless of the actual cost of doing the work.

Tables 5 and 6 summarizes the final question on the utility survey: whether or not the

Table 4 - Summary of Responses to: "When action is taken, how are your costs typically recovered?"

Response	Number of Responses	Percent of Total Responses
Reimbursable (actual cost billed to customer)	12	71%
Fixed rate for service (flat fee)	1	6%
Other (specific items provided by respondents)		
• No charge	5	29%
• No set policy, varies depending on specific job conditions	2	12%
• Estimated cost	1	6%

*Number of questionnaires returned = 17 (some respondents gave more than one response)

Table 5 - Summary of Responses to: "Do you have any public awareness programs specifically targeting the construction community regarding overhead power lines (i.e. overhead power line hotline similar to underground utilities, etc.)?"

Response	Number of Responses	Percent of Total Responses
Yes	11	65%
No	6	35%

* Number of questionnaires returned = 17

Table 6 - Actual Descriptions of "Yes" and "No" Responses From Table 5.

Descriptions of "Yes" responses:
• "See attachment. We make presentations to construction companies and contractors who use boom equipment and hand out the attachment, which is explained, for proper safe clearances." (The reference attachment is presented in Appendix E)
• "High voltage demo given to various construction companies, Cement Pump Truck Assoc., other non-electrical utilities, video on electrical burns."
• "We use voluntary company employees (Lifeliners) to present 'Safe-Tee-Opolis' and 'Safety-City' demonstrations as an electrical safety program."
• "We have safety meetings for contractors."
• "Specific targeted mailing of brochures, stickers etc. Annual Contractor Hazardous Awareness meetings."
• "We keep contract with our Trade Allies and use these opportunities to educate them. We also participate in their safety programs often. Thirdly, we do occasional radio spots relating to overhead electrical safety."
• "Public Safety Administrator oversees customer safety meetings dealing with O.H. power line safety."
• "Presentations are made to construction companies as needed or on request. When the utility company becomes aware of a "condition", an inspection of site is made, verbal contact is made with the contractor, and a follow-up letter is sent with copy to the state OSHA Office."
• "Video w/instructional dialog programs for all construction and industrial companies in our service area. Numerous educational materials: i.e. see enclosed." (See Appendix E).
• "Newspaper ads."
• "Electrical demonstration on overhead power lines - Miss Dig conference annually."
Descriptions of "No" Responses:
• "Programs and policy currently being developed and implemented to comply with 12 NYCRR Part 57-High Voltage Proximity Act."
• "We are currently looking into an ad campaign directed @ area contractors."
• "Do have a general public awareness that has a portion targeted for construction."
• "We have a program we use in our schools that we use for Fire Departments and some other cases. School program is for 4th grade and we do 1500 kids a year."

utility has any programs that are designed to educate the construction community regarding overhead power lines safety. Utilities replying they did have public awareness programs constituted 65 percent (eleven responses) of the respondents. Thirty-five percent (six responses) of the respondents indicated that they did not have any public awareness programs. Table 6 presents the actual responses that were given concerning the different types of programs utilities may use. Of the "Yes" responses (those with awareness programs), the most common type of programs are high voltage demonstrations and presentations for construction and industrial companies in the utility's area. Five of the eleven "Yes" respondents, 45 percent, responded in this way. The next most frequent program described by the respondents (three replies) were participation in safety meetings with contractors. Two respondents indicated they have instructional videos that are used for educating various parties, and two respondents stated their company has special brochures, stickers, and posters that are specially targeted for overhead power line safety. One respondent had an unique way of distributing information about overhead power lines: occasionally using radio air time as their communication medium. Advertising via newspaper ads was also given by one respondent. Two respondents also provided attachments as samples of the kind of materials that are distributed.

Detroit Edison provided three informative brochures on the following subjects: "MISS DIG" services (overhead and underground utilities), cranes and electricity, and proper ways to handle electrical emergencies. The brochure for crane operations near overhead lines appears to be a very informative brochure. The brochure states that the time to take care of power line problems is after the first site visit by the contractor. Detroit Edison stresses the next step is to call "MISS DIG" so that a representative from Detroit Edison can assess the project conditions and offer any advice. The brochure also describes the responsibility of crane operators, signaling procedures, what to do in an emergency, how to dismount a machine if there is imminent danger, and the clearances that are required by Michigan state law.

Sacramento Municipal Utility District (SMUD) provided sections 2946, 2947, 2948, and 2949 of Article 37, Title 8 of the California Code of Regulations, along with Penal Code 385. Penal Code 385 describes the punishment when proper clearances are not maintained. Sections 2946 - 2949 describe the proper clearances for personnel who are not qualified electrical workers and equipment working in the vicinity of overhead power lines. SMUD indicated that this information is handed out to construction companies when presentations are conducted. Appendix E contains the aforementioned documents.

Of the responses that stated "No", three of them further explained that current efforts are being undertaken to develop programs in order to expand awareness for overhead power line safety.

CHAPTER 5

MUNICIPALITY RESPONSES

Ninety-three (93) municipality questionnaires were mailed out and forty-one (41) responses were received. Of the forty-one responses, fifteen came from western area of the United States, fifteen from the central region of the United States, and eleven responses came from the eastern portion of the United States.

The first question in the municipality survey asked owners of projects about the kinds of requirements included in their construction documents that specifically provide for worker/equipment protection from contact with overhead power lines. Ninety-five percent (95%) of the respondents indicated that the contractor must comply with federal and state safety regulations. The next most frequent reply, 27 percent, related to requiring the contractor to reroute the lines to another overhead location. The least frequent reply (of the options provided) was a tie between three requirements each representing only 5 percent of the total respondents: bury the lines, provide specific worker training, and install barrier cables parallel to the overhead lines. It is interesting to note that additional responses provided by the respondents mostly included items requiring the contractors to coordinate their action with the local utility. Table 7 summarizes the responses to this particular issue. The exact descriptions of "other" responses are also included in Table 7.

Table 8 shows the summary of responses to the question of who is generally assumed to be responsible for construction site safety on city projects. Fifty-six percent (56%) of the respondents indicated that the contractor is solely responsible for site safety while only 10 percent stated both the contractor and owner share equally in this responsibility. Thirty-four percent (34%) indicated the owner may have limited involvement in safety with the majority of responsibility still in the

Table 7 - Summary of Responses to: "When overhead power lines are in the vicinity of construction sites being undertaken by the city, what kinds of contractor requirements are included in your construction documents to provide worker/equipment protection from contact with overhead power lines?"

Type of Contract Requirements	Number of Responses	Percent of Total Responses
Contractor must comply with federal and state safety regulations	39	95%
Reroute the lines (to another overhead location)	11	27%
Disconnect electrical power during the construction work	8	20%
Ground equipment (cranes, backhoes, etc.)	3	7%
Provide specific worker training is required to avoid the overhead lines	2	5%
Bury the lines	2	5%
Install barrier cables parallel to the overhead power lines	2	5%
Other: (additional responses provided by respondents)	9	22%
•"Casing put on lines when crane operates nearby to prevent contact."		
•"Show location of overhead lines in the contract plans and identify as 'High Voltage Line'."		
•"Contractor required to coordinate with utility."		
•"Occasionally shield (cover lines with plastic) by power company."		
•"Utility is responsible for relocation of lines during construction. Our contractors must coordinate with the local utility."		
•"Would request local utility company (Pacific Gas & Electric) to reroute power lines."		
•"Require coordination between contractor and utility. Utility will either shield the line or de-energize. If that won't work-try something else like removing the line permanently or temporarily."		
•"Plan note to notify the Ohio Utilities Protection Service."		
•"Utility company provides shields (fiberglass) installed on lines in areas adjacent to work effort."		

* Number of questionnaires returned = 41 (Some respondents gave more than one response)

Table 8 - Summary of Responses to: "On city construction projects, who is generally assumed to be responsible for construction site safety?"

Response	Number of Responses	Percent of Total Responses
Contractor is solely responsible.	23	56%
Contractor maintains overall responsibility with owner having limited involvement in safety.	14	34%
Both contractor and owner share equally in the responsibility.	4 ^a	10%
Other: (additional responses provided by respondents)		
• "Contractor is assigned complete responsibility in contract but owner/city has right to shut down job if we feel it is unsafe-we shut down jobs every year based on safety-to my knowledge never for power lines. Trenching or traffic control typically."		
• "Contractor required to provide insurance policy indemnifying city against any and all lawsuits arising from contractor's actions."		
• "Owner points out unsafe conditions to be corrected by the contractor."		
• "The contractor is responsible and the onsite inspector is responsible for monitoring the contractor."		
• "Contractor for city projects must be fully bonded, insured etc. to maximum limits."		
• ^a One respondent stated the owner is the local electrical/cable/phone company not the city.		

* Number of questionnaires returned = 41 (Some respondents gave more than one response)

hands of the contractor. Additional responses to this question included statements such as the contractor being responsible for site safety, however, the city's inspectors monitor the contractor and can shut the job down anytime the inspector feels an unsafe condition exists. One respondent stated that the city is indemnified against any lawsuits that might arise as a result of a contractor's actions.

The last question on the municipality survey was asked to determine how many cities had their own specific regulations or codes that required the contractor to assess or review how they will address the hazards posed by overhead power lines. As summarized in Table 9, seventy-three percent of the respondents stated "No" that their city did not have any specific codes dealing with overhead power line safety. In contrast, 22 percent responded with a "Yes". In addition to answering "Yes", the respondents were asked to describe the specific city regulations or codes that require contractors to review or assess how they will address overhead power lines in the vicinity of the construction site. Two respondents stated the contractor must follow the requirements in *GENERAL ORDER No. 95 Rules for Overhead Electric Line Construction* prescribed by the Public Utilities Commission of the State of California. Another two respondents indicated the contractor must comply with the requirements of CALOSHA. One respondent stated contractors must meet with utilities to work out the best alternatives while another respondent indicated the utility must be present at the pre-construction conference and that the contractor is required to notify the utility so that the utility can locate underground utilities forty-eight hours prior to excavation. Only one respondent provided an actual document specifically addressing overhead power line safety. The document provided was Sections 40.1-49.4 of the Code of Virginia, title 59.1, chapter 30, *Overhead High Voltage Line Safety Act*. This act defines the conditions under which work may be performed safely and the safety arrangements that must be taken when work is being conducted in the proximity of overhead high voltage lines (see Appendix F for complete description). This chapter in part states when a person or employee is working in the vicinity of overhead power lines a minimum of six feet must be maintained at all times. (This includes any

Table 9 - Summary of Responses to: "On all projects undertaken within the city limits, are there any specific regulations or codes that require construction contractors to review or assess how they will address the hazards posed by existing overhead power lines?"

Response	Number of Responses	Percent of Total Responses
No	30	73%
Yes	9	22%
Additional information provided by "Yes" respondents:		
•"Meet only with utility companies to work out best option for all involved."		
•"One-call system contact, utility locates 48 hours prior to excavation, pre-construction conference with all utilities present."		
•"General order 95 of the PUC-State of California."		
•"Construction note on plans specifying that it is the contractors responsibility to protect existing overhead and underground utilities in the construction area."		
•"Contractors are strictly required to follow California Occupational Safety and Health Admin (CALOSHA) regulations."		
•"There are state and federal guidelines for proper construction techniques."		
•"See attached copy." (See Appendix F, "VIRGINIA ACTS OF ASSEMBLY")		
•"PUC General Order 95; Cal OSHA, Construction Safety Orders; CalTrans, Standard Specifications, Section 7."		
•"Contract specifications require that the contractor be thoroughly familiar with all aspects of the work site before submitting a bid."		
Additional information provided by "No" respondents:		
•"As to overhead power lines, contractors are bound by building code and utility company regulations. City does not maintain any overhead power lines. On occasion, contractor may be required to comply with city engineer's departmental requirements."		
•"However, on projects with state or federal funding, the contractor is required to submit a safety plan to the Engineer."		
•"During pre-construction meetings, a power company representative attends to discuss conflicts, relocation, and potential safety issues."		

* Number of questionnaires returned = 41 (two did not respond to this question)

tool or material used by the person). The operation of any covered equipment, other than equipment operated on public streets and highways that are in compliance with the imposed height restriction, must be kept a minimum of ten feet from the overhead power line. If proximity must be closer than the above requirements, arrangements can be made between all concerned parties that include: "(i) placement of temporary mechanical barriers separating and preventing contact between material, equipment, or persons and overhead high voltage lines, (ii) temporary de-energization and grounding, (iii) temporary relocation or raising of the lines, or (iv) other such measures found to be appropriate in the judgment of the owner or operator of the lines."

Additional comments provided by the "No" respondents included items such as one respondent stating that contractors must comply with building codes and utility company requirements and on occasion, the contractor may be required to comply with the "city engineer's departmental requirements". However, the respondent did not indicate what the "city engineer's departmental requirements" may be.

CHAPTER 6

CONTRACTOR RESPONSES

The contractor responses were documented in the same manner as the responses of the utilities and municipalities. One hundred eight-four questionnaires were mailed out and fifty-five of them were returned. The western and central areas of the United States each accounted for nineteen responses while contractors from the eastern area of the United States provided seventeen responses.

The first two questions on the contractor's questionnaire were to determine the approximate volume of projects undertaken per year and what percentage of those projects had overhead power lines at the construction site. As shown in Table 10, the mean value of projects undertaken per year is roughly eighty-two, and typically, 63 percent of those projects had overhead power lines in the vicinity of the construction site. Table 10 summarizes the responses to the first two questions on the survey, providing detailed information on each contractor respondent, including the number of jobs undertaken per year along with the percentage of jobs containing overhead power lines.

Table 11 summarizes responses to the next question on the survey: "What contract requirements have been stipulated on some past contracts to address the hazards posed by the presence of overhead power lines?" Not one requirement was clearly stipulated more often than others. Three responses were fairly consistent with each other. Disconnecting the power during the construction work was checked on thirty-nine of the fifty-five questionnaires (71 percent), rerouting the lines to another overhead location was checked on thirty-eight questionnaires (69 percent), and on thirty-two of the questionnaires (58 percent) specific training of the employees was marked as the contract requirement. Five respondents revealed that they had never

Table 10 - Summary of Responses to: "How many projects are undertaken in a typical year and how many of those projects have power lines at or near the construction site?"

Questionnaire Received *	Number of projects per year	Percent of Projects with overhead power lines nearby
(a)	4-6	50%
(b)	5-6	90%
(c)	7-8	90%
(d)	8	90%
(e)	10	50%
(f)	10	100%
(g)	10	75%
(h)	10-12	10%
(i)	10-15	90%
(j)	15	100%
(k)	15	20%
(l)	20	20%
(m)	20	100%
(n)	20	40%
(o)	20-25	50%
(p)	20-25	90%
(q)	25	15%
(r)	25	40%
(s)	25-40	75%
(t)	30	75%
(u)	30	90%
(v)	30+	100%
(w)	35	70%
(x)	35	80%
(y)	40	85%
(z)	50	5%
(aa)	50	40%
(bb)	50	90%
(cc)	50	100%
(dd)	50	90%
(ee)	60	35%
(ff)	60	30%
(gg)	70-90	90%
(hh)	75	80%
(ii)	75	40%

Table 10 cont.

Questionnaire Received	Number of projects per year	Percent of Projects with overhead power lines nearby
(jj)	80	90%
(kk)	80	100%
(ll)	80	40%
(mm)	80-100	40%
(nn)	80-100	40%
(oo)	100	80%
(pp)	100	90%
(rr)	100	25%
(ss)	100	50%
(tt)	100+	90%
(uu)	100+	20%
(vv)	115	90%
(ww)	200	85%
(xx)	200	85%
(yy)	200	50%
(zz)	230	20%
(aaa)	250+	20%
(bbb)	300+	55%
(ccc)	400	50%
(ddd)	500	75%
	Mean = 82** Median = 50	Mean = 63% Median = 75%

* Number of questionnaires returned = 55

** Where a range is given the midpoint was used to determine the overall mean.

Table 11 - Summary of Responses to: "What contract requirements have been stipulated on some past contracts to address the hazards posed by the presence of overhead power lines?"

Response	Number of Responses	Percent of Total Responses
Disconnecting electrical power during the construction work.	39	71%
Rerouting the lines (to another overhead location).	38	69%
Providing specific worker training to avoid overhead lines	32	58%
Burying the lines.	20	36%
Installing barrier cables parallel to the overhead power lines.	17	31%
Grounding of the equipment (cranes, backhoes, etc.).	13	24%
Other: (Responses sorted by grouping, see Appendix G for actual responses)	20	36%
• None	5	-
• Insulate lines	4	-
• Comply with all city, state and federal regulations	3	-
• Maintain minimum clearances	3	-
• Warning signs/devices	2	-
• Designate spotter	1	-
• Mark line on ground indicating no work to be performed inside the line.	1	-
• Special permit requirements	1	-

* Number of questionnaires returned = 55 (Some respondents gave more than one response)

encountered any requirements specifically in the contracts documents addressing overhead power line safety. Some actual responses included such statements as; "None by contract", "I have never seen contract language relative to overhead lines", and "Generally these hazards are not specifically addressed in contract documents."

The next question on the survey dealt with finding out what type of actions or methods contractors imposed on themselves in order to protect their employees from contact with overhead power lines. The most common answer to this question by far was worker training. Ninety-three percent of the respondents indicated that specific training was the method used in order to avoid contact with overhead power lines. Disconnecting power and rerouting the overhead lines were the second and third most common answers with 78 percent and 76 percent, respectively. Burying the lines was a method employed by twenty-seven respondents (49 percent of the respondents). Reviewing Table 12, one can see the remaining items on the questionnaire have similar numbers of responses that ranged from 38 percent for installing barrier cables parallel to power lines, to 25 percent for using insulating links on hoisting equipment. The most common responses for "other" responses were insulating the lines with rubber goods (seven responses), and using warning signs/devices to visually alert operators and employees.

The remaining question on the contractor's questionnaire was specifically aimed at having the contractor respondents describe in their own words how their firm would address a situation where overhead power lines crossed a portion of the construction site along with mobile equipment being operated in the vicinity of the overhead lines. The responses to this question were grouped into like responses and are presented in tabular form in Table 13. The actual responses to this question are presented in Appendix I. An example of some of the actual responses are presented below:

Table 12 - Summary of Responses to: "What ways has the company used to avoid worker contact with overhead power lines?"

Response	Number of Responses	Percent of Total Responses
Providing specific worker training to avoid overhead lines	51	93%
Disconnecting electrical power during the construction work.	43	78%
Rerouting the lines (to another overhead location).	42	76%
Burying the lines.	27	49%
Installing barrier cables parallel to the overhead power lines.	21	38%
Using proximity warning devices on equipment.	19	35%
Grounding of the equipment (cranes, backhoes, etc.).	18	33%
Using insulating links on hoisting equipment.	14	25%
Other: (Responses sorted by grouping, see Appendix H for complete details)	23	40%
• Insulate lines	(7)	
• Warning signs/devices	(6)	
• Restricting swing radius, coordinating crane locations/movements	(4)	
• Maintain minimum clearance	(3)	
• Use spotters	(2)	
• Use of faraday cages to dissipate static electric fields	(1)	

* Number of questionnaires returned = 55 (Some respondents gave more than one response)

Table 13 - Summary of Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

Response Grouping ¹	Number of Responses	Percent of Total Responses*
• Line warning devices; orange balls, flags, tape, signs.	22	40%
• Discuss with subs, utility etc. during safety, tool box, and pre-construction meetings	21	38%
• Employee training	19	35%
• De-energize	17	31%
• Reroute/bury lines	17	31%
• Blanket/sleeve lines	12	22%
• Maintain distance greater than 10' / comply with OSHA regs.	10	18%
• Avoid/limit construction activity in area; limit boom length; carefully position crane	10	18%
• Install Barriers	4	7%
• Provide spotter/flag person	3	5%
• Ground equipment	1	2%
• Use height gauge poles for reference	1	2%

¹ For actual responses, see Appendix I.

* Number of questionnaires returned = 55 (Most respondents gave more than one response)

"First choice - Have line moved or placed underground; Second choice - Have line de-energized during peak exposure periods; Third choice - Shield the line; Fourth choice - Use signs and other devices to draw attention to the line."

"The lines would be marked with hanging banners initially so they are easily seen by the operators. When work was being conducted around them, we would provide a spotter to ensure that the operator stayed a minimum 10' away. If the machine needed to be closer, then we would have the lines temporarily de-energized."

"Address situation in pre-construction meeting with own people and subs. Address situation at weekly safety meeting. Investigate having lines moved. Put protective rubbers on lines in area of prolonged activity."

"Company has an internal procedure that prohibits any operation closer than 10'. Any project that violates this procedure results in the project manager being terminated. Procedure establishes alternatives for operations that require regional manager, safety manger approval."

The most common response (40 percent) was the use of line warning devices: orange balls, flags, tape, and signs. Thirty-eight percent responded with discussing the situation with subcontractors and or the local utility at some form of meeting, such as the pre-construction conference, weekly tool box meetings, or special safety meetings. This represented the second most common response.

In addition to the written responses, three firms provided documents that are used to address overhead power line safety. One firm submitted a "UTILITY INJURY PREVENTION AND DAMAGE CONTROL PLAN." This plan requires the contractor to select one of three options prior to performing any work where electrical distribution lines (overhead and underground) are present. This plan must be submitted to the Corporate Safety Director with the Superintendent's, Project Manager's, and Equipment Operator's signatures prior to commencing

work. Another contractor submitted a "UTILITY INTERFERENCE PROCEDURE" checklist, along with a safety meeting outline for work directly involving overhead utilities, and "EXISTING UTILITY LOCATE PROCEDURE" checklist (mainly for underground utilities). The third separate documentation submitted by a contractor was a "PRE-JOB SAFETY CHECKLIST." This checklist reminds the contractor to check the hazards posed by any overhead power lines by asking three questions: "Are all known?", "Who is responsible for interruptions?", and are there "Safe clearances to high voltage lines?" All of the above documents are contained in Appendix J.

CONCLUSIONS AND RECOMMENDATIONS

7.1. CONCLUSIONS

From the results of the survey, it appears that training employees is the most common method contractors use to prevent worker/equipment contact with overhead power lines. On the other hand, when contractors were asked the open-ended question about how they would address the situation where power lines crossed a portion of the site, the most common reply was installing line warning devices to the power lines such as tapes, flags, and orange balls. Responses indicate that training is accomplished on a regular basis, however, when contractors are faced with a specific situation at the job site, using line warning devices is the preferred precautionary measure employed. The contractor respondents represented a variety of geographic areas throughout the United States. No correlation appeared to exist between contractor practices and geographic location.

The contractor respondents offered a variety of methods that may be used to prevent worker/equipment contact with overhead power lines. Most of the methods can easily be employed by various companies. In fact, only one method may be difficult to adopt in other companies. This precautionary measure was terminating the project manager if any equipment operation came within ten feet of overhead power lines. This may very well be an excellent method for this one particular firm, however, implementing as a recommended industry standard may be very difficult. The type of action most often required by contract documents is to disconnect the power lines. However, on the other extreme is that five contractors stated they had never seen any such requirements stipulated in contract documents. This may indicate that there are a wide range of views on who is responsible for overhead power line safety.

The study shows that overhead power lines are a common occurrence on construction sites. An average of 63 percent of the construction projects had overhead lines in the vicinity of the construction work. The common occurrence of overhead power lines at construction sites explains why electrocutions are the among the most frequently reoccurring accidents in the construction industry.

Municipalities are minimally involved with addressing safety pertaining to contact with overhead power lines other than requiring the contractor to coordinate their activities with the local utility. Municipalities assume or accept very limited responsibility for construction site safety. Most municipalities act like observers and merely oversee the contractor's operations. There appear to be very few specific city codes requiring special action by contractors who have overhead power lines in the vicinity of their construction sites. Although some municipalities specify contractor actions, they generally relate to compliance with federal and state regulations and no specific city codes. This may be from the result of one of the following three items: (1) Some municipalities believe they have specific codes, when in actuality they do not, (2) Some municipalities do have specific city codes, however, they were not effectively presented, or (3) the question was ambiguous.

The results of the utility questionnaire indicated that there is a large range in the number of inquiries that different utilities receive each year regarding overhead power line safety. The only viable conclusion from this is that questions are being asked of utilities on a fairly regular basis. Contractors are seeking the local utility for advice, and approximately one-half of the time action is taken by the utility as a result of the inquiry. The most common action taken by utilities is to insulate the lines with rubber goods. This is probably because insulating power lines has the least amount of impact regarding time and money for all concerned parties. Also, other common actions are to reroute the power lines to other overhead locations, and to disconnect electrical power.

Customers (owners or contractors) generally pay for any service provided by the utility, however, some actions offered by utilities are free.

A majority of utilities have some sort of public awareness program targeting the construction industry. Of the utilities that stated they have no programs in place, most were currently developing such programs. Overall, utilities are taking an active part with overhead power line safety and realizing their efforts have an important impact on the construction industry.

7.2. RECOMMENDATIONS

The findings of the study disclosed various practices and precautions that are currently implemented in the construction industry in regards to preventing worker/equipment contact with overhead power lines. Contractors must continue to regard safety as a number one priority. Relying on the minimum clearances required by state and federal laws should not be considered adequate. Along with maintaining minimum clearances additional safety measures should be employed, namely flagging, signage and the use of spotters. Conducting a thorough pre-job checklist should always be accomplished. From the results of this study, a comprehensive contractor safety checklist for working near overhead power lines can be developed. If overhead power lines will be in the vicinity of the construction operations, it is recommended that the following questions be addressed prior to commencing work:

- Are there any special contract requirements in the contract documents?
- Has the local utility been notified?
- Can the power lines be buried, rerouted, or de-energized?
- Will the proper warning signs be posted?
- Are the minimum clearances fully understood by all parties?
- Are the lines adequately marked with visual warning devices?
- Is the "limit of approach" clearly marked on the ground for additional reference?

- Are all employees properly trained?
- Are the foremen and superintendent fully aware of the situation?
- Can the lines be insulated with rubber goods?
- Is the lifting equipment equipped with additional safety devices?
- Can the operations be moved to a different location?
- Is a spotter designated?
- Are all tag lines polypropylene?
- Are there long spans that may be subject to swaying in the wind?
- Will equipment be traversing uneven ground that may lead to excessive bouncing?

Adhering to the aforementioned pre-job checklist or a similar type of checklist will provide an organized approach for preventing electrocutions from overhead power lines.

Municipalities (owners) and utilities can have a great impact in preventing overhead power line contact. Municipalities need to be more proactive in overhead power line safety. Contract documents should have specific requirements addressing overhead lines, and responsibility should not be solely placed on the contractors. All utilities should have an education program in place for communicating with the construction community about the hazards of overhead power lines along with how to work safely around them.

To further address overhead power line electrocutions, additional research should be conducted to determine if there are any correlations between the frequency of contact with overhead power lines and the type of precautionary measures that are employed to prevent contact. Maintaining the minimum clearance required by OSHA is the most frequent infraction contributing to electrocutions. Efforts must be expended to assure the minimum clearances are strictly obeyed. One requirement that may have a positive effect on reducing electrocutions is requiring the use of a spotter/signal person at all times where operations (hoisting, excavating, concrete pumping, etc.) are in the vicinity of overhead power lines, whether or not the "limit of approach" is near.

Being informed about possible practices to prevent electrocutions can provide valuable insight about actions needed to produce fewer fatalities. The high response rate for this study (30 percent) shows that the interest among the construction community in this topic is high. However, one single group within the construction industry cannot effectively, for a continuous period of time, reduce the number of electrocutions. An effective solution must involve all parties (contractors, owners, utilities, etc.), and teamwork will be the key to positive results.

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13. *Directory of Electric Utilities*. 101st ed. 1993.
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19. "DIRECTORY OF CONTRACTORS Northeast Region." *ENR*, 9th ed. 1991-92.

APPENDIX A
QUESTIONNAIRES AND COVER LETTERS

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

April 30, 1993

Department of Civil Engineering

Dear Public Official:

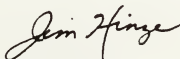
There are approximately 2000 fatal injuries each year in the construction industry. Over 200 of these fatalities are electrocutions which are a direct result of contact with overhead power lines. In many cases, the power lines were only located in the vicinity of the construction sites and not part of the actual construction effort.

As part of the University of Washington's Graduate Program of Construction Engineering and Management, we are conducting a study among contractors, utility companies, and municipalities in order to solicit information on efforts being taken in the construction industry to minimize contact with overhead power lines.

We would appreciate your participation and would like to ask you to take a few minutes to fill-out the enclosed questionnaire and return it in the envelope provided. Feel free to include relevant attachments or enclosures. The study is expected to be completed in August 1993. Copies of the summary report will be forwarded to all participants who request them.

Your cooperation is greatly appreciated, and we would like to thank you in advance for your time and effort in completing the questionnaire. If you have any questions regarding any aspect of the questionnaire or study, please feel free to contact us.

Sincerely,



Jim Hinze

Professor

206-543-7612

FAX 206-543-1543



Scott Hinton

Graduate Student

206-543-7363

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

Department of Civil Engineering

April 30, 1993

Dear Construction Safety Professional:


There are approximately 2000 fatal injuries each year in the construction industry. Over 200 of these fatalities are electrocutions which are a direct result of contact with overhead power lines. In many cases, the power lines were only located in the vicinity of the construction sites and not part of the actual construction effort.

As part of the University of Washington's Graduate Program of Construction Engineering and Management, we are conducting a study among contractors, utility companies, and municipalities in order to solicit information on efforts being taken in the construction industry to minimize contact with overhead power lines.

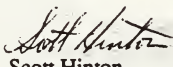
We would appreciate your participation and would like to ask you to take a few minutes to fill-out the enclosed questionnaire and return it in the envelope provided. Feel free to include relevant attachments or enclosures. The study is expected to be completed in August 1993. Copies of the summary report will be forwarded to all participants who request them.

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Sincerely,


Jim Hinze

Professor
206-543-7612
FAX 206-543-1543


Scott Hinton

Graduate Student
206-543-7363

UNIVERSITY OF WASHINGTON
SEATTLE, WASHINGTON 98195

May 4, 1993

Department of Civil Engineering

Dear Safety Professional:

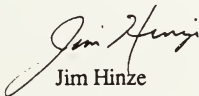
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Sincerely,

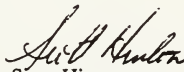


Jim Hinze

Professor

206-543-7612

FAX 206-543-1543



Scott Hinton

Graduate Student

206-543-7363

**Overhead Power Lines
Questionnaire**

(1) How many inquiries per year do you receive specifically addressing overhead power lines in the vicinity of construction sites? _____

(2) As a result of the inquiries, how often is the utility company asked to take a specific action to reduce the hazard posed by overhead power lines? _____%

(3) What type of action is most commonly taken?

_____ Disconnect power during the construction work.

_____ Reroute power lines overhead.

_____ Bury the power lines.

_____ Other (please describe): _____

(4) When action is taken, how are your costs typically recovered?

_____ Reimbursable (actual cost billed to customer).

_____ Fixed rate for service (flat fee).

_____ Other (please describe): _____

(5) Do you have any public awareness programs specifically targeting the construction community regarding overhead power lines (i.e. overhead power line hotline similar to underground utilities, etc.)? _____ Yes (please describe below) _____ No

REQUEST FOR SUMMARY REPORT

If you would like a copy of the summary report, please provide the following information:

(ALL OF YOUR RESPONSES WILL REMAIN CONFIDENTIAL)

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Telephone number _____

Overhead Power Lines Questionnaire

- (1) When overhead power lines are in the vicinity of construction sites being undertaken by the city, what kinds of contract requirements are included in your construction documents to provide worker/equipment protection from contact with overhead power lines?

(check all that apply)

- ☐ Contractor must comply with federal and state safety regulations.
 - ☐ Provide specific worker training is required to avoid the overhead lines.
 - ☐ Reroute the lines (to another overhead location).
 - ☐ Bury the lines.
 - ☐ Disconnect electrical power during the construction work.
 - ☐ Ground equipment (cranes, backhoes, etc.).
 - ☐ Install barrier cables parallel to the overhead power lines.
 - ☐ Other (please describe): _____
- _____
- _____

- (2) On city construction projects, who is generally assumed to be responsible for construction site safety?

- ☐ Contractor is solely responsible.
 - ☐ Contractor maintains overall responsibility with the owner having limited involvement in safety.
 - ☐ Both contractor and owner share equally in the responsibility.
 - ☐ Other (please describe): _____
- _____
- _____

- (3) On all projects undertaken within the city limits, are there any specific regulations or codes that require construction contractors to review or assess how they will address the hazards posed by existing overhead power lines?

- ☐ No specific regulation or city law has been enacted.
 - ☐ Yes (please describe below) _____
- _____
- _____
- _____
- _____

REQUEST FOR SUMMARY REPORT

If you would like a copy of the summary report, please provide the following information:
(ALL OF YOUR RESPONSES WILL REMAIN CONFIDENTIAL)

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Telephone number _____

Overhead Power Lines Questionnaire

- 1) How many projects are undertaken by your firm in a typical year? _____
- 2) How many of the above projects would you estimate have overhead power lines on or near the construction site? _____%
- 3) Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents? (please describe):
- _____
- _____
- _____
- _____
- 4) What contract requirements have been stipulated on some past contracts to address the hazards posed by the presence of overhead power lines? **(check all that apply)**
- _____ Providing specific worker training to avoid the overhead lines.
- _____ Rerouting the lines (to another overhead location).
- _____ Burying the lines.
- _____ Disconnecting electrical power during the construction work.
- _____ Grounding of the equipment (cranes, backhoes, etc.).
- _____ Installing barrier cables parallel to the overhead power lines.
- _____ Other (please describe): _____
- _____
- 5) What ways has the company used to avoid worker contact with overhead power lines? **(check all that apply)**
- _____ Providing specific worker training to avoid the overhead lines.
- _____ Rerouting the lines (to another overhead location).
- _____ Burying the lines.
- _____ Disconnecting electrical power during the construction work.
- _____ Grounding of the equipment (cranes, backhoes, etc.).
- _____ Installing barrier cables parallel to the overhead power lines.
- _____ Using insulating links on hoisting equipment.
- _____ Using proximity warning devices on equipment.
- _____ Other (please describe): _____
- _____

REQUEST FOR SUMMARY REPORT

If you would like a copy of the summary report, please provide the following information:
(ALL OF YOUR RESPONSES WILL REMAIN CONFIDENTIAL)

Name _____ Title _____

Company _____

Street _____

City _____ State _____ Zip _____

Telephone number _____

APPENDIX B
UTILITY ADDRESSES

APPENDIX B

UTILITY ADDRESSES

- | | |
|--|--|
| 1. Georgia Power Company
333 Piedmont Ave
Atlanta, Georgia 30308 | 11. Long Island Lighting Company *
P.O. Box 188
Northport, NY 11768 |
| 2. PNM Public Service Company of
New Mexico
Alvarado Square
Albuquerque, NM 87158 | 12. Pacific Power and Light Company
920 SW Sixth Ave
Portland, OR 97204 |
| 3. Missouri Public Service
10700 East 350 Highway
P.O. Box 117839
Kansas City, Missouri 64138 | 13. Duquesne Light Company
One Oxford Centre
301 Grant St
Pittsburgh, PA 15279 |
| 4. Central Maine Power
General Office
Edison Drive
Augusta, Maine 04336 | 14. Public Service of New Hampshire
1000 Elm St
P.O. Box 330
Manchester, NH 03105 |
| 5. Union Electric
1901 Chauteau Ave
P.O. Box 149
St. Louis, Missouri 63166 | 15. Snohomish County PUD
P.O. Box 1107
Everett, WA 98206 |
| 6. Allegheny Power System
800 Cabin Hill Drive
Greensburg, PA 15601 | 16. FPL
P.O. Box 029100
Miami, FL 33102 |
| 7. Sierra Pacific Power Company
6100 Neil Road
P.O. Box 10100
Reno, Nevada 89520-0026 | 17. Southern California Edison Company
P.O. Box 800
2131 Walnut Grove Ave
Rosemead, CA 91770 |
| 8. Consumers Power Co.
212 West Michigan Ave
Jackson, MI 49201 | 18. Benton County PUD
P.O. Box 6270
Kennewick, WA 99336-0270 |
| 9. AP & L
Arkansas Nuclear One
Route 3, Box 137G
Russellville, AR 72801 | 19. Gulf States Utilities Company
P.O. Box 2951
Beaumont, TX 77704 |
| 10. Mississippi Power Company
2992 West Beach Blvd
P.O. Box 4079
Gulfport, Mississippi 39502-4079 | 20. Wisconsin Power & Light Company
222 West Washington Ave
P.O. Box 192
Madison, WI 53701-0192 |

APPENDIX B cont.

UTILITY ADDRESSES

- | | |
|---|--|
| 21. Ohio Edison
76 South Main St
Akron, Ohio 44308 | 31. Commonwealth Electric Company
2421 Cranberry Highway
Wareham, Massachusetts 02571 |
| 22. Jackson Utility Division
P.O. Box 68
Jackson, Tennessee 38302-0068 | 32. Washington Water Power
P.O. Box 3727
Spokane, WA 99220 |
| 23. Jacksonville Electric Authority
233 West Duval St
P.O. Box 53015
Jacksonville, FL 32201 | 33. American Electric Power
1 Riverside Plaza
Columbus, OH 43215 |
| 24. Wisconsin Electric Power Company
231 W. Michigan
P.O. Box 2046
Milwaukee, WI 53201 | 34. Jersey Central Power & Light Co.
Madison Avenue at Punch Bowl Road
Morristown, NJ 07960 |
| 25. Public Service Company of Oklahoma
212 East Sixth St
P.O. Box 201
Tulsa, OK 74102-0201 | 35. Metropolitan Edison Company
P.O. Box 16001
Reading, PA 19640 |
| 26. New York State Electric and Gas Corp.
4500 Vestal Parkway East
Binghamton, NY 13903 | 36. The Cincinnati Gas & Electric Co.
P.O. Box 960
Cincinnati, OH 45201-0960 |
| 27. Washington Public Power Supply
System.
P.O. Box 968
3000 George Washington Way
Richland, WA 99352 | 37. Bonneville Power Administration
P.O. Box 491
Vancouver, WA 98666-0491 |
| 28. Minnesota Power
30 West Superior St
Duluth, Minnesota 55802 | 38. Kansas City Power & Light Company
P.O. Box 418679
Kansas City, Missouri 64141-9679 |
| 29. Lubbock Power and Light
P.O. Box 2000
Lubbock, TX 79457 | 39. Central & South West Services, Inc
2121 San Jacinto St Ste 2500
P.O. Box 660164
Dallas, TX 75266-0164 |
| 30. Iowa-Illinois Gas & Electric Company
P.O. Box 4350
206 East Second St
Davenport, Iowa 52808 | 40. Madison Gas & Electric Company
P.O. Box 1231
Madison, Wisconsin 53701-1231 |

APPENDIX B cont.

UTILITY ADDRESSES

- | | |
|--|---|
| 41. Philadelphia Electric Company
2301 Market St
P.O. Box 8699
Philadelphia, PA 19601 | 51. San Diego Gas & Electric
P.O. Box 1831
San Diego, CA 92112 |
| 42. Chelan County PUD
P.O. Box 1231
Wenatchee, WA 98907-0011 | 52. Puget Sound Power & Light Company
Puget Power Bldg.
Bellevue, WA 98009 |
| 43. Alabama Power
600 North 18th St
P.O. Box 2641
Birmingham, AL 35291 | 53. Arkansas Power & Light
P.O. Box 551
Little Rock, AR 72203 |
| 44. Public Utilities Board
P.O. Box 3270
Brownsville, TX 78520-3270 | 54. Nevada Power Company
6226 W Sahara Ave
Box 230
Las Vegas, NV 89151 |
| 45. Upper Peninsula Power Company
616 Sheldon Ave
Houghton, Michigan 49931 | 55. Arizona Public Service Company
400 N fifth St
Phoenix, AZ 85004 |
| 46. Idaho Power Company
Box 70
Boise, Idaho 83707 | 56. Pacific Gas & Electric Company
77 Beale St
San Francisco, CA 94106 |
| 47. Tacoma Public Utilities
3628 South 35th St
P.O. Box 11007
Tacoma, WA 98411 | 57. Citizens Utilities Company
High Ridge Park
Box 3801
Stamford, CT 06905 |
| 48. Portland General Electric Company
Trojan Nuclear Plant
71760 Columbia River Hwy
Rainier, OR 97048 | 58. Connecticut Light & Power Company
Selden St
Berlin, CT 06037-1616 |
| 49. Sacramento Municipal Utility District
P.O. Box 15830
Sacramento, CA 95852-1830 | 59. Delmarva Power & Light Company
800 King St
P.O. Box 231
Wilmington, DE 19899 |
| 50. Seattle City Light
1015 3rd Ave
Seattle, WA 98104-1198 | 60. Potomac Electric Power Company
1900 Pennsylvania Ave NW
Washington, DC 20068 |

APPENDIX B cont.

UTILITY ADDRESSES

- | | |
|--|---|
| 61. Florida Power & Light Co
700 Universe Blvd
Juno Beach, FL 33408 | 71. Interstate Power Co
100 Main St.
P.O. Box 769
Dubuque, IA 52004-0769 |
| 62. Florida Power Corp
3201 34th St South
P.O Box 14042
St. Petersburg, FL 33733 | 72. Iowa Power INC
666 Grand Ave
Box 657
Des Moines, IA 50303 |
| 63. Savannah Electric and Power Co.
600 Bay St. E.
Savannah, GA 31402 | 73. Iowa Southern Utilities Co
300 Sheidan Ave
Centerville, IA 52544 |
| 64. Hawaiian Electric Co. Inc.
900 Richards St.
Honolulu, HI 96813-0001 | 74. Kansas Gas & Electric Co
120 E. First St
Box 208
Wichita, KS 67201 |
| 65. Common Wealth Edison Co.
One First National Plaza
P.O. Box 767
Chicago, IL 60690-0767 | 75. The Kansas Power and Light Co
818 Kansas Ave
Topeka, KS 66612 |
| 66.. Central Illinois Public Service
607 E. Adams St
Springfield, IL 62739 | 76. Kentucky Utilities Co
One Quality St
Lexington, KY 40507 |
| 67. Illinois Power Company
500 S. 27th St
Decatur, IL 62525-1805 | 77. Louisville Gas and Electric Company
P.O. Box 32010
220 W. Main St
Louisville, KY 40232 |
| 68. Indiana-Kentucky Electric Corp
P.O. Box 468
Piketon, OH 45661 | 78. Louisiana Power and Light Co.
317 Baronne St
New Orleans, LA 70112 |
| 69. Indiana Michigan Power Corp
One Summit South
Box 60
Fort Wayne, IN 46801 | 79. Baltimore Gas and Electric Co.
P.O. Box 1475
Baltimore, MD 21203 |
| 70. Indianapolis Power & Light
25 Monument Circle
P.O. Box 1595
Indianapolis, IN 46206-1595 | 80. The Potomac Edison Co.
10435 Downsview Pike
Hagerstown, MD 21740-1766 |

APPENDIX B cont.

UTILITY ADDRESSES

- | | |
|--|--|
| 81. Boston Edison Co.
800 Boylston St
Boston, MA 02199 | 91. West Texas Utilities Co.
301 Cypress
Abilene, TX 79601-5820 |
| 82. Massachusetts Electric Co
25 Research Dr.
Westborough, MA 01582 | 92. Central Vermont Public Service Corp.
77 Grove Street
P.O. Box 608
Rutland, VT 05701 |
| 83. Detroit Edison Co.
2000 Second Ave.
Detroit, MI 48226 | 93. Virginia Electric and Power Co.
One James River Plaza
P.O. Box 26666
Richmond, VA 23261 |
| 84. Minnesota Power and Light Co
30 West Superior St
Duluth, MN 55802 | 94. Wheeling Power Co.
51 Sixteenth St
Box 751
Wheeling, WV 26003 |
| 85. Otter Tail Power Co
215 S. Cascade
Fergus Falls, MN 56537 | 95. Carolina Power and Light Co.
411 Fayetteville St Mall
Raleigh, NC 27602 |
| 86. Central Hudson Gas and Electric Corp
284 South Ave.
Poughkeepsie, NY 12601 | 96. Montana-Dakota Utilities Co.
400 N. Fourth St.
Bismark, ND 58501 |
| 87. Long Island Lighting Co.
175 E. Old Country Rd
Hicksville, NY 11801 | 97. The Toledo Edison Co.
300 Madison Ave
Toledo, OH 43652 |
| 88. Central Power and Light Co.
539 N Carancahua St
Box 2121
Corpus Christi, TX 78403 | 98. Oklahoma Gas and Electric Co.
101 N. Robinson
Oklahoma City, OK 73102 |
| 89. Houston Lighting and Power Co.
P.O. Box 1700
Houston, TX 77001 | 99. Pacificorp
700 NE Multnomah
Suite 1600
Portland, OR 97232-4116 |
| 90. Texas-New Mexico Power Co.
4100 Int'l Plaza
P.O. Box 2943
Fort Worth, TX 76113 | 100. Pennsylvania Electric Co.
1001 Broad St.
Johnstown, PA 15907 |

* Returned as unable to deliver.

APPENDIX C
MUNICIPALITY ADDRESSES

APPENDIX C

MUNICIPALITY ADDRESSES

1. City of Albuquerque
City Hall
P.O. Box 1293
Albuquerque, NM 87103
2. City of Atlanta
68 Mitchell St. S. W.
Atlanta, Georgia 30335
3. City of Baltimore
The Municipal Bldg.
Baltimore, Maryland 21202
4. City of Boston
1 City Hall Plaza
Boston, MA 02201
5. City of Buffalo
City Hall
65 Niagara Square
Buffalo, NY 14202
6. City of Charlotte
600 East 4th Street
Charlotte, NC 28402
7. City of Chicago
121 N. LaSalle Street Rm 406
Chicago, IL 60602
9. City of Cincinnati
1600 Gest St
Cincinnati, OH 45204
8. City of Cleveland
601 Lakeside Ave NE
Cleveland, OH 44114
10. City of Columbus
90 W. Broad St.
Columbus, OH 43215
11. City of Dallas
320 E. Jefferson St
Dallas, TX 75235
12. City of Denver
1437 Bannock St.
Denver, CO 80202
13. City of Detroit
Cadillac Tower, 9th Fl
Detroit, MI 48226
14. City of El Paso
2 Civic Center Plaza
El Paso, Texas 79901
15. City of Houston
P.O. Box 1562
Houston, Texas 77251-1562
16. City of Kansas City
Municipal Ofc Building
701 N 7th St
Kansas City, MO 66101
17. City of Las Vegas
400 E Stewart St
Las Vegas, NV 89101
18. City of Long Beach
333 W. Ocean Blvd.
Long Beach, CA 90802
19. City of Louisville
601 W. Jefferson
Louisville, KY 40202
20. City of Miami
P.O. Box 330708
Miami, FL 33133
21. City of Milwaukee
841 N. Broadway 5th Fl
Milwaukee, Wisconsin 53202
22. City of Minneapolis
350 S. 5th St
Minneapolis, MN 55415
23. City of St. Paul
25 W. 4th St
St. Paul, MN 55102
24. City of Honolulu
650 S. King St
Honolulu, HI 96813

APPENDIX C cont.

MUNICIPALITY ADDRESSES

- | | |
|--|--|
| 25. City of Nashville
750 S. 5th St
Nashville, TN 37206 | 37. City of San Jose
801 N. 1st St
San Jose, CA 95110 |
| 26. City on New Orleans
1300 Perdido St
New Orleans, LA 73102 | 38. City of Seattle
600 4th Street
Seattle, WA 98104 |
| 27. City of Oklahoma City
200 N. Walker Avenue
Oklahoma City, OK 73102 | 39. City of Tampa
306 E. Jackson St
Tampa, Florida 33602 |
| 28. City of Olympia
P.O. Box 1967
Olympia, WA 98507 | 40. City of Tulsa
200 Civic Center
Tulsa, OK 74103 |
| 29. City of Omaha
Omaha-Douglas Civic Ctr,
1819 Farnam St
Omaha, NE 68183 | 41. City of Washington
2000 14th St NW
Washington, D.C. 20009 |
| 30. City of Philadelphia
1321 Arch St 10th Fl
Philadelphia, PA 19107 | 42. City of Tucson
P.O. Box 27 210
Tucson, AZ 85716 |
| 31. City of Phoenix
101 S Central Ave
Phoenix, AZ 85003 | 43. City of Los Angeles
City Hall
Los Angeles, CA 90012 |
| 32. City of Pittsburgh
414 Grant St, Ste 512
Pittsburgh, PA 15219 | 44. City of Albany
City Hall
Albany, NY 12207 |
| 33. City of Portland
1120 S.W. 5th Ave
Portland, OR 97204 | 45. City of Anchorage
P.O. Box 196650
Anchorage, AK 99519-6655 |
| 34. City of St. Louis
City Hall Rm 301
St. Louis, MO 63103 | 46. City of Anaheim
P.O. Box 3222
Anaheim,. CA 92803 |
| 35. City of San Antonio
P.O. Box 839966
San Antonio, TX 78283-3966 | 47. City of Baton Rouge
P.O. Box 1471
Baton Rouge, LA 70821 |
| 36. City of San Francisco
City Hall Rm 260
San Francisco, CA 94104 | 48. City of Berkeley
2180 Milvia St
Berkeley, CA 94704 |

APPENDIX C cont.

MUNICIPALITY ADDRESSES

- | | |
|---|---|
| 49. City of Birmingham
City Hall
710 N 20th St
Birmingham, AL 35203 | 61. City of Grand Rapids
300 Monroe Ave. NW
Grand Rapids, MI 49503 |
| 50. City of Cedar Rapids
City Hall, 50 Second Ave Bridge
Cedar Rapids, IA 52401 | 62. City of Huntington Beach
2000 Main St
Huntington Beach, CA 92648 |
| 51. City of Chattanooga
City Hall 100 E. 11th St
Chattanooga, TN 37402 | 63. City of Indianapolis
City-County Bldg.
200 E. Washington St
Indianapolis, IN 46204 |
| 52. City of Chula Vista
P.O. Box 1087
Chula Vista, CA 91912 | 64. City of Irving
P.O. Box 152288
Irving, TX 75015-2288 |
| 53. City of Durham
101 City Hall Plaza
Durham, NC 27701 | 65. City of Jacksonville
220 E Bag Street
Jacksonville, FL 32202 |
| 54. City of Erie
626 State St
Erie, PA 16501 | 66. City of Knoxville
P.O. Box 1613
Knoxville, TN 37901 |
| 55. City of Everett
3200 Cedar St
Everett, WA 98201 | 67. City of Lubbock
P.O. Box 2000
Lubbock, TX 79457 |
| 56. City of Flint
1101 S. Saginaw St
Flint, MI 48502 | 68. City of Modesto
P.O. Box 642
Modesto, CA 95353 |
| 57. City of Fort Lauderdale
949 NW 38th St
Fort Lauderdale, FL 33309 | 69. City of Montgomery
P.O. Box 1111
Montgomery, AL 36101-1111 |
| 58. City of Fortworth
1000 Throckmorton St
Fortworth, TX 76102 | 70. City of New York
22 Reade St
New York, NY 10007 |
| 59. City of Fresno
2223 G St
Fresno, CA 93706 | 71. City of Newark
920 Broad St
Newark, NJ 07102 |
| 60. City of Glendale
633 E. Broadway St
Glendale, CA 91206 | 72. City of Newport News
513 Oyster Point Rd
Newport News, VA 23602 |

APPENDIX C cont.

MUNICIPALITY ADDRESSES

- | | |
|---|---|
| 73. City of Norfolk
810 Union St
Norfolk, Virginia 23510 | 85. City of San Diego
202 C St
San Diego, CA 92101 |
| 74. City of Orange
P.O. Box 449
Orange, CA 92666 | 86. City of Simi Valley
2929 Tapo Canyon Rd
Simi Valley, CA 93063 |
| 75. City of Oxnard
305 W. 3rd St
Oxnard, CA 93030 | 87. City of Sioux City
P.O. Box 447
Sioux City, IA 51102 |
| 76. City of Pasadena
100 N. Garfield Ave
Pasadena, CA 91109-7215 | 88. City of Sioux Falls
224 W 9th St
Sioux Falls, SD 57102 |
| 77. City of Providence
700 Allens Ave
Providence, RI 02905 | 89. City of Syracuse
1200 Canal St Ext
Syracuse, NY 13202 |
| 78. City of Raleigh
P.O. Box 590
Raleigh, NC 27602 | 90. City of Tacoma
747 Market St
Tacoma, WA 98402 |
| 79.. City of Reno
P.O. Box 1900
Reno, NV 89505 | 91. City of Vancouver
P.O. Box 1995
Vancouver, WA 98668-1995 |
| 80. City of Rochester
30 Church St 300B
Rochester, NY 14614-1278 | 92. City of Wichita
City Hall
455 N Main St
Wichita, KS 67202 |
| 81. City of Sacramento
922 10th St Rm 200
Sacramento, CA 95814 | 93. City of Tallahassee
300 S Adam St
Tallahassee, FL 32301 |
| 82. City of Salem
555 Liberty St SE
Salem, OR 97301 | |
| 83. City of St. Petersburg
P.O. Box 2842
St. Petersburg, FL 33731 | |
| 84. City of Salt Lake City
451 S. State St
Salt Lake City, UT 84111 | |

APPENDIX D
CONTRACTOR ADDRESSES

APPENDIX D

CONTRACTOR ADDRESSES

- | | |
|---|--|
| 1. Pitt-DesMoines Inc.
3400 Grand Ave. Neville
Pittsburgh, PA 15225 | 13. Blount Construction Group
4520 Executive Pl.
Montgomery, AL 36116 |
| 2. Tidewater Const. Co.
P.O. Box 57
Norfolk, VA 23501 | 14. CDI Construction Co.
3000 Cantrell Rd
Little Rock, AR 72202 |
| 3. United Engrs and Constr Int'l
P.O. Box 8223
Philadelphia, PA 19101 | 15. Harbert Construction Co.
100 Concourse Pkwy
Birmingham, AL 35202 |
| 4. BE&K Inc.
2000 International Pk Dr.
Birmingham, AL 3543 | 16. Hubbard Const. Co.
1936 Lee Rd
Winter Park, FL 32789 |
| 5. Brice Bldg Co. Inc.
P.O. Box 1028
Birmingham, AL 35201 | 17. The Hardaway Co.
945 Broadway
Columbus, GA 31993 |
| 6. Rust International Corp.
P.O. Box 101
Birmingham, AL 35201 | 18. Barnard and Burk Group, Inc.
3854 American Way
Baton Rouge, LA 70816-40134 |
| 7. The Haskell Co.
Haskell Bldg.
Jacksonville, FL 32231 | 19. Schumacher & Forelle
9560 Northern Blvd
Great Neck, NY 11021 |
| 9. Beers, Inc.
P.O. Box 1375
Atlanta, GA 30301 | 20. Turner Corp.*
633 Third Avenue
New York, NY 10017 |
| 8. Holder Construction Co.*
900 Ashwood Pkwy
Atlanta, GA 30338 | 21. Yonkers Contracting
969 Midland Ve, Box 39
Birmingham, AL 35233 |
| 10. Pizzagilli Const. Co.
P.O. Box 200
South Burlington, VT 05401 | 22. Brasfield and Gorrie Inc.
729 S. 30 Street
Birmingham, AL 35233 |
| 11. Torcon, Inc.
P.O. Box 609
Westfield, NJ 07091 | 23. Robins Corp.
P.O. Box 59289
Birmingham, AL 35259 |
| 12. Wohlsen Const. Co.
548 Steelway, Box 7066
Lancaster, PA 17604 | 24. Balfour Beatty, Inc.
2 S Biscayne Blvd.
Miami, FL 33131 |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|---|---|
| 25. Barge-Wagener, Inc.
1815 The Exchange
Atlanta, GA 30339 | 37. Donohoe Construction Co.
2101 Wisconsin Ave NW
Washington DC 20007 |
| 26. Hardin Construction Group, Inc.
1380 W Paces Ferry Rd NW
Atlanta, GA 30327 | 38. L.F. Driscoll Co.
9 Presidential Blvd
Bala Cynwyd, PA 19004 |
| 27. Boh Bros Construction Co, Inc.
P.O. Box 53266
New Orleans, LA 70153 | 39. Ebasco Services Inc.
2 World Trade Center Fl 92
New York, NY 10048 |
| 28. A-J Contracting Co. Inc.
470 Park Ave. S
New York, NY 10016 | 40. Eichleay Holdings, Inc
Fifth and Penn Avenues
Pittsburg, PA 15206 |
| 29. H.B. Alexander & Son, Inc.
315 Vaughn St PO Box 1525
Harrisburg, PA 17105 | 41. George A. Fuller Co.
919 Third Avenue
New York, NY 10022 |
| 30. Barr & Barr, Inc.
330 West 42 St
New York, NY 10036 | 42. Gilbane Building Co.
7 Jackson Walkway
Providence, RI 02940 |
| 31. Barry, Bette & Led Duke, Inc
P.O. Box 12789
1245 Kings Road
Albany, NY 12212 | 43. E.W. Howell Co. Inc.
2 Seaview Blvd P.O. Box 2000
Port Washington, NY 11050 |
| 32. Cianbro Corporation
32 Hunnewell Ave Box D
Pittsfield, ME 04967 | 44. Jones Group, Inc.
One S Executive Park
Charlott, NC 28287 |
| 33. Day and Zimmerman, Inc.
1818 Market Street
Philadelphia, PA 19103 | 45. Kajima International, Inc.
2100 North Central Road
Ft Lee, NJ 07024 |
| 34. Dick Corporation
P.O. Box 10896 Pleasant Hills
Pittsburg, PA 15236 | 46. Daniel J. Keating Const. Co.
812 Lancaster Avenue
Villanova, PA 190 85 |
| 35. Dimeo Enterprises, Inc.
75 Chapman Street
Providence, RI 02905 | 47. Marshall Contractors, Inc.
75 Newman Avenue
Rumford, RI 02916 |
| 36. P.J. Dick Contracting
P.O. Box 98100
Pittsburg, PA 15227 | 48. HBE Corporation
11330 Olive Street
St. Louis, MO 63141 |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|--|--|
| 49. Morse/Diesel, Inc.
1515 Broadway
New York, NY 10036 | 61. Huber Hunt & Nichols Inc.
2450 S Tibbs
Indianapolis IN 46241 |
| 50. Chicago Bridge and Iron Co.
800 Jorie Blvd
Oak Brook, IL 60522 | 62. F A wilhelm Const Co Inc.
3914 Prospect St
Indianapolis, IN 46206 |
| 51. Grayor Inc.
12233 Ave O
Chicago, IL 60633 | 63. Weitz Co Inc.
800 Second Ave
Des Moines, IA 50309 |
| 52. Great Lakes Dredge & Dock Co.
2122 York Rd.
Oak Brook, IL 60521 | 64. Eby Corp
P.O. Box 1679
Wichita, KS 67201 |
| 53. S A Healy Co.
9600 W 47 St
McCook, IL 60525 | 65. James N Gray Const. Co. Inc.
250 W Main St.
Lexington, Ky 40507 |
| 54. Gust K Newberg Const Co.
2040 N Ashland Ave
Chicago, IL 60614 | 66. Baron-Malow Co
27777 Franklin Rd
Southfield, MI 48034 |
| 55. W E O'Neil Industries Inc.
2751 N Clybourn Ave
Chicago, IL 60614 | 67. A J Etkin Const Co
31440 Northwestern Hwy
Farmington Hills, MI 48334 |
| 56. Perpper Construction Inc.
643 N Orleans St
Chicago, IL 60610 | 68. Haden Management Corp.
32450 N Avis Dr.
Madison Heights, MI 48071 |
| 57. Power Contracting and Engineering Corp.
1895 PRohlwing Rd.
Rolling Meadows, IL 60008 | 69. Townsend & Bottum Inc.
2245 S. State St
Ann Arbor, MI 48104 |
| 58. Paul H Schwendener Inc.
1000Vandustrial Dr.
Westmont, IL 60559 | 70. Adolfson & Peterson Inc.
6701 W 23 St.
Minneapolis, MN 55426 |
| 59. Walsh Construction Co of IL
3710 S Western Ave
Chicago, IL 60609 | 71. Al Johnson Const Co.
3209W 76 St
Minneapolis, MN 55435 |
| 60. Geupel DeMars Inc.
PO Box 887
Indianapolis, IN 46241 | 72. Knutson Constrution Co.*
5301 E. River Rd.
Minneapolis, MN 55421 |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|---|--|
| <p>73. Kraus-Anderson Construction Co.
525 S Eight St
Minneapolis, MN 55404</p> | <p>85. Kokosing Const Co Inc.
220 Market Ave S
Canton, OH 44702</p> |
| <p>74. McGough Const. Co. Inc.
2737 N Fairview Ave
St Paul, MN 55113-1327</p> | <p>86. Frank Messer & Sons Const Co.
4612 Paddock Rd.
Cincinnati, OH 45229</p> |
| <p>75. M A Mortenson Co.
700 Meadow Lane N
Minneapolis, MN 55422</p> | <p>87. OHM Corp
16406 US Rte 224 E
Findlay, OH 45840</p> |
| <p>76. Opus Corp
P.O. Box 150
Minneapolis, MN 55440</p> | <p>88. Rudolpj/Libbe Construction Inc.
6494 Latcha Rd.
Walbridge, OH 43465</p> |
| <p>77. J S Alberici Const Co Inc.
2150 Klenlen Ave.
St Louis, MO 63121-5592</p> | <p>89. Oscar J Boldt Const Co.
2525 N Roemer Rd
Appleton, WI 54915</p> |
| <p>78. J E Dunn Const Co.
929 Holmes St.
Kansas City, MO 64106</p> | <p>90. Marshall Erdman & Assocs
5117 University Ave
Madison, WI 53705</p> |
| <p>79.. Fru-Con Const Corp
15933 Clayton Rd.
Ballwin, MO 63022-0100</p> | <p>91. Hunzinger Const. Co.
21100 Enterprise Ave
Brookfield, WI 53005</p> |
| <p>80. McCarthy
1341 N Rock Hill Rd
St Louis, MO 63124</p> | <p>92. Lunda Const Co
P.O. Box 669
Black River Falls, WI 54615</p> |
| <p>81. Sverdrup Corp
13723 Riverport Dr.
Maryland Hts, MO 63043</p> | <p>93. C R Meyer & Sons Co
895 W 20 Ave
Oshkosh, WI 549803-2157</p> |
| <p>82. Kiewit Const Grou[Inc.
1000 Kiewit Plaza
Omaha, NE 68131</p> | <p>94. John Brown E&C Inc.
333 Ludlow St
Stamford, CT 06902</p> |
| <p>83. The Austin Co.
3650 Mayfield Rd
Cleveland, OH 44121</p> | <p>95. Morganti Group Inc.
10 South St
Ridgefield, CT 06877</p> |
| <p>84. Danis Inds Corp.
2 Riverplace
Dayton, OH 45405</p> | <p>96. The Clark Const Group IN=nc.
7500 Old Georgetown Rd
Bethesda, MD 20814-6195</p> |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|---|--|
| 97. SAE America Inc.
7200 Wisconsin Ave
Bethesda, MD 20814-4811 | 109. HuntCor Inc.
426 N 44 St
Phoenix, AZ 85008 |
| 98. Whiting Turner Contracting CO.
300 E Joppa RD
Baltimore, MD 21204 | 110. Kichell Constructors
1006 S 24 St
Phoenix, AZ 85035 |
| 99. Badger Co Inc.
One Broadway
Cambridge, MA 02142 | 111. Mountain States Mineral Ent
4370 S Fremount Ave.
Tucson, AZ 85714 |
| 100. Perini Corp
73 Mt Wayte Ave
Framingham, MA 01701 | 112. Manhattan Bldg. Co.*
1717 S Boulder
Tulsa, OK 74119 |
| 101. Stone & Webster Engr Corp
245 Summer St.
Boston, MA 02210 | 113. EMJ Corporation
6148 Lee Parkway
Chattanooga, TN 37421 |
| 102. Suffolk Const Co Inc.
65 Allerton St
Boston, MA 02119 | 114. Belmont Construction Inc.
2400 West Loop S
Houston, TX 77027 |
| 103. ABB Lummus Crest Inc.
1515 Broad St
Bloomfield, NJ 07003 | 115. CRSS, Inc.
1177 W Loop S
Houston, TX 77027 |
| 104. Burns & Roe Ent Inc.
700 Kinderkamack Rd
Oradell, NJ 07649 | 116. HCB Constructors
140 Elm Street
Dallas, TX 75202-1006 |
| 105. Foster Wheeler Corp
Perryville Corp Park
Clinton, NJ 08809-4000 | 117. Lee Lewis General Contractor
P.O. Box 65197
Lubbock, TX 79464 |
| 106. Henderson Corp
575 Hwy 28
Raritan, NJ 08889 | 118. S & B Engineers & Construction, Inc.
P.O. Box 266245
Houston, TX 77207-6245 |
| 107. Chanen Const Co. Inc
3300 N Third Ave
Phoenix, AZ 85067-3967 | 119. M B Kahn Construction Co.
P.O. Box 1179
Columbia, SC 29202 |
| 108. Gosnell Bldrs
2728 N 24 St
Phoenix, AZ 85008 | 120. United Dominion Const.
6000 Poplar Avenue
Memphis, TN 38119 |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|--|--|
| 121. Brown & Root Inc.
P.O. Box 3011
Houston, TX 77001 | 133. Sundt Corp.
4101 E Irvington Rd
Tucson, AZ 85714 |
| 122. Fish Engineering & Construction*
P.O. Box 22535
Houston, TX 77227 | 134. S J Amoroso Const Co. Inc.
348 Hatch Dr
Foster City, CA 94404 |
| 123. Hunt Building Corp.
4401 N Mesa
El Paso, TX 79902-1107 | 135. ARB Inc.
4042 Patton Way
Bakersfield, CA 93309 |
| 124. Litwin Engineers & Construction, Inc.
P.O. Box 1281
Houston, TX 77251 | 136. Guy F. Atkinson Construction Co.
10 W. Orange Ave
San Francisco, CA 94080 |
| 125. Williams Bros Construction Co.
P.O. Box 66428
Houston, TX 77008 | 136. Ball & Brosamer, Inc.
333 Camille Ave
Alamo, CA 94507 |
| 126. Suitt Construction Co.
P.O. Box 8858
Greenville, SC 29604 | 138. Bechtel Group Inc.
P.O. Box 193965
San Francisco, CA 94119 |
| 127. Austin Commercial, Inc.
3535 Travis
Dallas, TX 75204 | 139. Birtcher Construction Ltd.
24051 Shelley Rd
Laguna Niguel, CA 92656 |
| 128. Centex Construction Group, Inc.
3333 Lee Parkway
Dallas, TX 75219 | 140. Devcon Construction Inc.
555 Los Coches St
Milpitas, CA 95035 |
| 129. Gulf States Inc.
P.O. Box 856
Freeport, TX 77541 | 141. Dillingham Construction
5960 Inglewood Dr.
Pleasanton, CA 94588 |
| 130. M W Kellogg Co.
1300 Three Greenway Plaza
Houston, TX 77046-0395 | 142. Fluor Daniel
3333 Michelson Dr.
Irvine, CA 92730 |
| 131. Lott Construction Inc.
3500 S. Gessner
Houston, TX 77063 | 143. Granite Construction Co.
P.O. Box 900
Watsonville, CA 95077 |
| 132. H B Zachry Co.
P.O. Box 21130
San Antonio, TX 78221-0130 | 144. ICF Kaiser Engineers
1800 Harrison St
Oakland, CA 94117 |

APPENDIX D cont.

CONTRACTOR ADDRESSES

- | | |
|--|--|
| 145. International Tech Corp.
23456 Hawthorne Blvd.
Torrance, CA 90505 | 157. Peck/Jones Bros Construction
10866 Wilshire Blvd.
Los Angeles, CA 90024 |
| 146. Jacobs Engineering Group
251 S Lake Ave.
Pasadena, CA 91101 | 158. J R Roberts Inc.
7745 Greenback Lane
Citrus Heights, CA 95610 |
| 147. Kaiser Fndn Health Plan Inc.
3355 E 26 St
Los Angeles, CA 90023 | 159. Rudolph & Sletten Inc.
989 E Hillsdale Blvd
Foster City, CA 94404 |
| 148. Kajima Engrg & Const Inc.*
510 W Sixth St
Los Angeles, CA 90014 | 160. Sinerton & Walberg Co.
580 California St
San Francisco, CA 94507 |
| 149. Kasler Corp
P.O. Box 387
San Bernardino, CA 92402 | 161. A Teichert & Son Inc.
P.O. Box 15002
Sacramento, CA 95851 |
| 150. Keller Construction Co. Inc.
9950 E. Baldwin Place
El Monte, CA 91734 | 162. Tutor-Saliba Corp
15901 Olden St.
Sylmar, CA 91342 |
| 151. Koll Construction Co.
4343 Von Karman Ave.
Newport Beach, CA 92660 | 163. Ray Wilson Co.
199 S Los Robles
Pasadena, CA 91101 |
| 152. Macco Construction Inc.
14409 S Paramount Blvd
Paramount, CA 90723 | 164. Green Holdings Inc.
8055 E. Tufts Ave
Denver, CO 80237 |
| 153. McCormick Construction Co.
2507 Empire Ave
Burbank, CA 91504 | 165. Hensel Phelps Construction Co.
420 Sixth Ave
Greeley, CO 80632-0710 |
| 154. Morley Group Inc.
2901 28 St
Santa Monica, CA 90064 | 166. PCL Enterprises Inc.
2000 S Colorado Blvd.
Denver, CO 80222 |
| 155. Charles Pankow Bldrs Ltd.
One Nob Hill Circle
San Francisco, CA 94108 | 167. TIC-The Industrial Co.
P.O. Box 774848
Steamboat Springs, CO 80477 |
| 156. The Parsons Corp.
100 W Walnut St
Pasadena, CA 91124 | 168. Fletcher Construction (USA) Ltd.
707 Richards St
Honolulu, HI 96813 |

APPENDIX D cont.

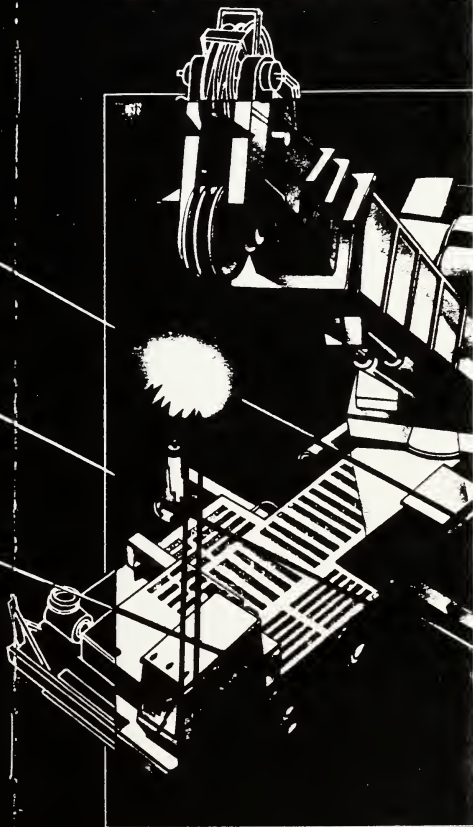
CONTRACTOR ADDRESSES

- | | |
|---|--|
| 169. Pan-Pacific Const Inc.
1001 Bishop St
Honolulu, HI 96813 | 178. Sellen Construction Co. Inc.
228 Ninth Ave N
Seattle, WA 98109 |
| 170. Morrison-Knudson Corp
P.O. Box 73
Boise, ID 83707-0073 | 179. Zum Nepco
P.O. Box 747
Redmond, WA 98073 |
| 171. Washington Contractors Group Inc.
101 International Way
Missoula, MT 59802 | 180. Nielson Construction Co.
3127 Jefferson St
San Diego, CA 92138-0577 |
| 172. Marnell Corrao Assocs. Inc.
4495 S Polaris Ave
Las Vegas, NV 89103 | 181. T L James & Co
P.O. Box 1260
Ruston, LA 71273-1260 |
| 173. Hoffman Corp
P.O. Box 1300
Portland, OR 97207 | 182. McDermott International
1010 Common St
New Orleans, LA 70112 |
| 174. Riedel International Inc.
P.O. Box 3320
Portland, OR 97208 | 183. Dunn Construction Co.
P.O. Box 3687
Jackson, MS 39207 |
| 175. Baugh Enterprises
900 Poplar Pl S
Seattle, WA 98114 | 184. Walbride Aldinger
613 Abbott St.
Detroit, MI 48226 |
| 176. Robert E. Bayley Construction Inc.
P.O. Box 4567
Seattle, WA 98104-0567 | |
| 177. Lease Crutcher Lewis
107 Spring St #500
Seattle, WA 98104-1052 | |

* Returned as unable to deliver.

APPENDIX E
DOCUMENTS PROVIDED BY UTILITIES

CRANE OPERATORS



Detroit
Edison

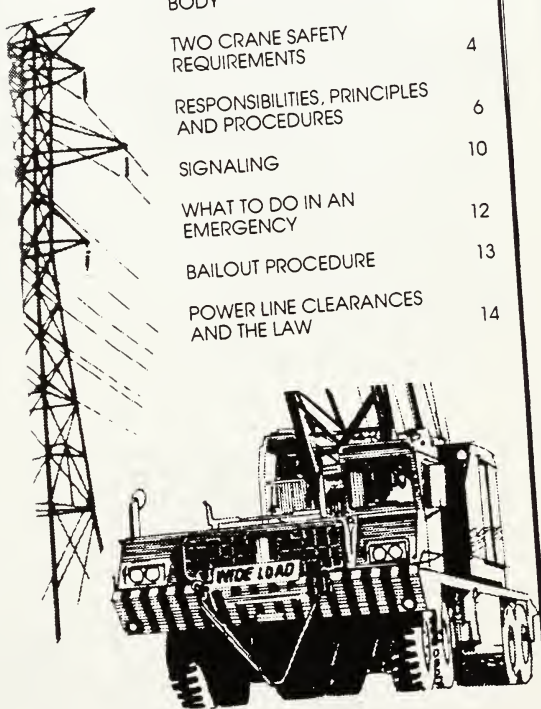
AND
ELECTRICITY

Detroit
Edison

Cranes & Electricity

Contents:

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ELECTRICITY AND THE HUMAN BODY	3
TWO CRANE SAFETY REQUIREMENTS	4
RESPONSIBILITIES, PRINCIPLES AND PROCEDURES	6
SIGNALING	10
WHAT TO DO IN AN EMERGENCY	12
BAILOUT PROCEDURE	13
POWER LINE CLEARANCES AND THE LAW	14



Cranes & Electricity

Electrocution occurs all too frequently during construction projects. As an example, contact with overhead electric power lines is the largest single cause of fatalities associated with cranes.

Working safely near power lines is a must.

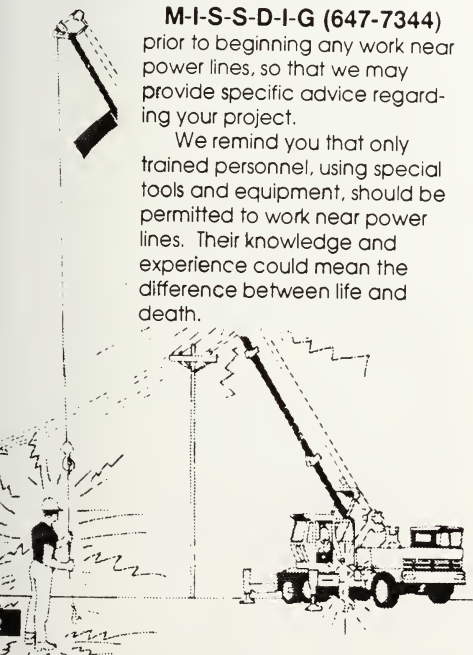
Introduction

Because it also is committed to your safety, Detroit Edison has prepared this brochure on safe crane operation.

We urge you to contact us by calling

M-I-S-S-D-I-G (647-7344) prior to beginning any work near power lines, so that we may provide specific advice regarding your project.

We remind you that only trained personnel, using special tools and equipment, should be permitted to work near power lines. Their knowledge and experience could mean the difference between life and death.



Electricity -- enough to kill -- will flow through metal, water, wet ground, certain moisture-retentive ropes, and even damp wood.

Machinery, equipment or materials touching electric power lines become electrified and dangerous. So can communication wires, fences, vehicles and other objects touched by fallen overhead lines.

Electricity and the Human Body

The risk of electrocution is high at energy levels as low as 25 volts. Even a small amount of current can cause muscles to contract and make the victim unable to "let go" of the live source. The duration of contact plays an important role in determining the effects of electrical current on the human body.

Death or injury may result from the following effects of electric current on the body:

- Contraction of chest muscles to a degree that causes suffocation.
- Temporary paralysis of the nerve center controlling respiration -- often continuing long after the victim is removed from the electrified source.
- Ventricular fibrillation causing stoppage of the heart and the cutoff of blood circulation to vital organs.
- Body tissue so badly burned that vital organs are unable to sustain life.

Cranes & Electricity

There are two requirements for crane safety that must be followed at all times.

1. Under no circumstances should any crane boom, load line or load be moved into an area around an electrical power line called the "absolute limit of approach," unless the line has been de-energized.

Two Crane Safety Requirements which Must Be Met

The absolute limit of approach is an area surrounding every electrical power line which defines minimum distances to be maintained between crane equipment and power lines, based on voltage levels of the lines.

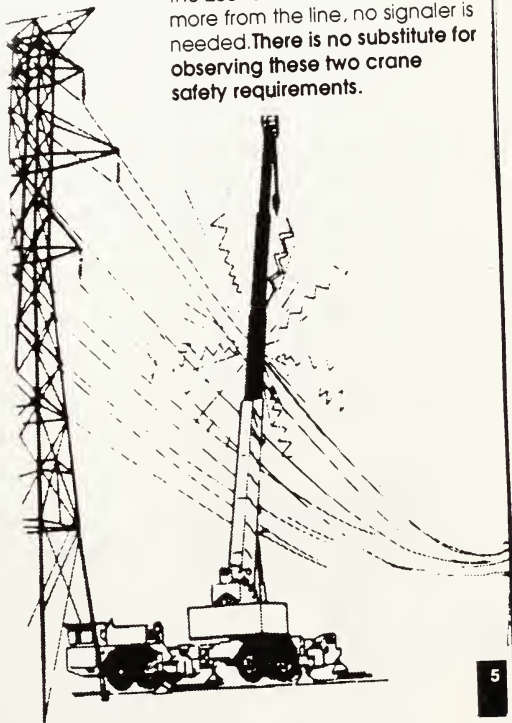
For example, the following are applicable distances:

Line Voltage	Absolute Limit of Approach
Up to 50,000 volts	10 feet
50,000 to 115,000 volts	12 feet
115,000 to 230,000 volts	16 feet
230,000 to 500,000 volts	25 feet

Observing the following guidelines will ensure worker safety by preventing contact with power lines.

2. It is necessary to have a signaller whose sole duty is to observe from the best vantage point available and warn the operator whenever the crane and its load are within a boom's length of the absolute limit of approach.

For example, for a line carrying up to 50,000 volts:
(a) if a crane has a 200-foot boom and the crane is 180 feet from a power line, a signaller must be used, or
(b) if, however, the crane with the 200-foot boom is 210 feet or more from the line, no signaller is needed. **There is no substitute for observing these two crane safety requirements.**



The time to take care of power line problems is during pre-job planning – after the first site survey has been completed by the contractor. A next step should be to call M-I-S-S-D-I-G (647-7344) to alert Detroit Edison of your project location and to obtain specific help and advice.

Responsibilities, Principles and Procedures

Crane Operators

Before setting up for or starting any project, crane operators should review the site survey, if available, and inspect the location of power lines and other hazards on or near the site. If the site survey is not available, a more thorough inspection of the location by the crane operator is in order.

Site Supervision

When power lines are present, safety of the crane operation and crews is the responsibility of personnel in charge of the job site.

1. It is the responsibility of the company which controls or directs the crane operation, through its project engineer, contractor, foreman or superintendent, to ensure that:

- Access roads and the working area for the crane are adequately prepared.

- Operating locations are chosen to ensure proper clearances with power lines. Otherwise, the power lines must be either de-energized or protected by barriers to prevent contact.

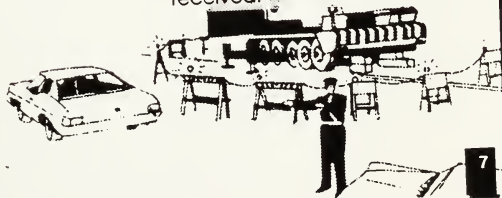
- Operating locations are far enough away from shoring, excavations, trenches, buried utility lines and foundations to eliminate risk of collapse.

- Operating locations are graded, level and compacted, whenever possible.

2. It is the responsibility of the project engineer, contractor, foreman or superintendent controlling the crane to ensure that:

- Adequate advance notification is provided to local utilities to allow for isolation or de-energizing of power lines. Call M-I-S-S-D-I-G (647-7344) to obtain specific help from Detroit Edison and to inform it of the project's location, when it will begin and end, and any scheduling changes that occur.

- All power lines are treated as energized until reliable information to the contrary has been received.



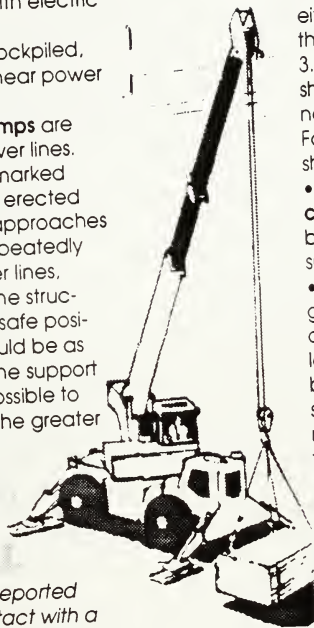
Cranes & Electricity

- **Warning signs** are posted prominently on the crane to keep personnel on the alert for accidental contact with electric wires.

- **Materials** are not stockpiled, loaded or unloaded near power lines.

- **Access roads or ramps** are not located near power lines.

- **Routes** are plainly marked and "rider poles" are erected on each side of the approaches when cranes must repeatedly travel beneath power lines, assuring that the crane structures are lowered to safe positions. The routes should be as close to the power line support towers or poles as possible to take advantage of the greater ground clearance.



- **Every incident** is reported which involves contact with a live power line to the electric utilities and the job site safety inspector. This ensures that inspections will be made and damage repaired to prevent power lines from failing or falling later.

- **Crane equipment** is completely inspected for possible damage caused by the electrical contact if contact with a live power line does occur.

- **Any cable touching a power line** is replaced if contact with a live power line does occur. The contact is usually sufficient to either weld or badly pit wires in the cable.

3. Still other safety precautions should be observed by personnel working near power lines. For example, crane operators should:

- **Slow the crane's operating cycle** by reducing hoisting, booming, swinging and travel speeds.

- **Issue strict warnings** to all ground personnel to stand clear of the crane at all times. If a load must be guided into place by hand, a special check should be made with the signaler before the rigger touches the load.

- **Set the swing brake.**

- **Refrain from relying, for personal safety, solely on** proximity warning devices, cage-type boom guards, swing-limit stops, hook insulators and insulating links. All have serious limitations and their use can lead to feelings of false security.

- **Use taglines** only when necessary. The best material for taglines near power lines is dry polypropylene rope. Both Manila hemp and nylon ropes retain moisture and can conduct electricity.

Cranes & Electricity

Signaling is an important part of crane operation but often is not treated with the importance it deserves.

The contractor, foreman or superintendent in charge of any operation using a crane must ensure that a competent, qualified signaler is assigned to work with any crane within a boom's length of a power line. The signaler must warn the operator when the crane is approaching the line because the operator may not be able to judge the distance accurately.

Signaling

The signaler should have no other duties while the crane is in operation near a power line. The law requires that a signaler be present at all times when:

(a) The crane is being operated within a boom's length of the absolute limit of approach to power lines or electrical equipment.

(b) The operator cannot clearly see the hook and load.

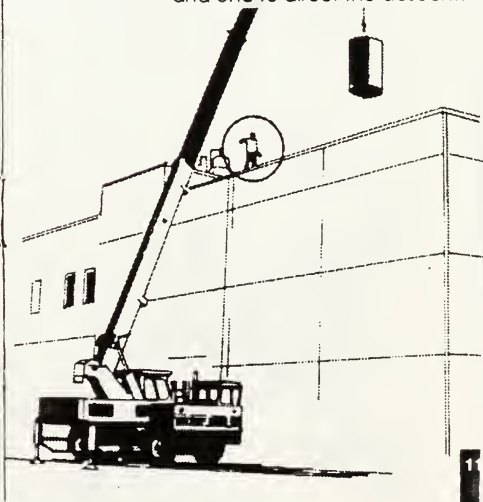
(c) The operator is too far away from the load to judge distances.

(d) The crane is traveling and the operator cannot see all parts of it or its path of travel.

The signaler must:

- Demonstrate a working understanding of and competence in carrying out his or her duties.
- Position himself or herself in full view of the operator and, if using hand signals, close enough for the signals to be seen clearly. The position must offer a full view of the crane, the load, and the load travel and landing areas while ensuring that the signaler will not be hit by the boom.
- Be in constant communication with the operator either through hand signals or by radio.

When loads are picked up at one point and lowered at another, two signalers may be required — one to direct the lift and one to direct the descent.



anes & Electricity

Contact with an overhead power line will result in electrical current flowing down the boom and through the crane to the ground. The ground surface will be energized with a higher voltage near the crane and lower voltage farther away.

If the crane or load makes contact with an energized

What to Do in an Emergency

power line, you (the operator) should:

- **Remain in the cab.** Don't panic. If you realize what has happened, you are safe where you are. If you move, you risk electrocution.
- **Instruct all other personnel** to keep away from the crane, rope and load. The entire machine, the load and the ground around it could be energized.
- **Try, unaided, to back the crane** until it is well clear of the power line.
- **If the crane cannot be moved away or disentangled from the line, remain inside until the electric utility de-energizes the line and confirms that conditions are safe.**

If, for reasons of safety or imminent danger, such as a fuel fire, you (the operator) decide to leave the machine:

- **Never step down** or allow any part of your body to contact the ground while any other part of you is touching the machine.

Bailout Procedure

- **You must jump clear.** Jump with feet together on takeoff and landing, then shuffle slowly away from the affected area.
- **Shuffling is important** to remember. Because there may be a hazardous voltage differences in the ground, never take large steps after landing. It is possible for one foot to be in a high-voltage area and the other to be in a lower-voltage area -- and the difference between the two could kill you.

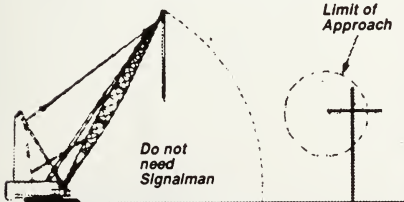


Cranes & Electricity

State and federal safety standards exist to protect crews and provide safer working conditions near power lines. These standards are administered by the Michigan Department of Labor under the Michigan Occupational Health and Safety Administration (MIOSHA) and the federal Occupational Safety Standards Commission. The following provisions from federal or state laws, differentiated below by the indicated symbols, apply specifically to the operation of cranes near electric power lines.

Power Line Clearances and the Law

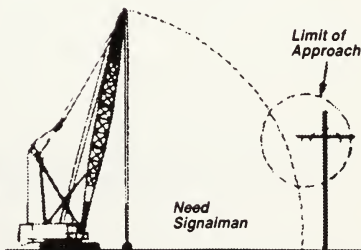
Refers, below, to provisions of state laws: Requirements of the Michigan Department of Labor, Michigan Occupational Health and Safety Administration, General Industry Safety Standards Commission, Part 19 - Section 408.11936(3). Clearances With Boom Raised (*Federal and Michigan laws are identical in effect, though different in wording*).



- For lines rated at 50,000 volts or below, minimum clearance between the lines and any part of the crane or load must be 10 feet.
- For lines rated at more than 50,000 volts, minimum clearance between the lines and any part of the crane or load must be 10 feet plus 0.4 inch for each 1,000 volts over 50,000.
- For voltages to ground of 50,000 volts or below, the location of the nearest conductive object must be a minimum of 10 feet.
- For voltages to ground of more than 50,000 volts, the location of the nearest conductive object must be a minimum of 10 feet plus four inches for every 10,000 volts over 50,000.

Clearances in Transit - No Load

- With no load and the boom lowered, minimum clearance between the lines and any part of the crane must be a minimum of four feet for voltages of fewer than 50,000 volts; 10 feet for voltages of from 50,000 volts to 345,000 volts; and 16 feet for voltages of from 345,000 volts to 750,000 volts.



ranes & Electricity

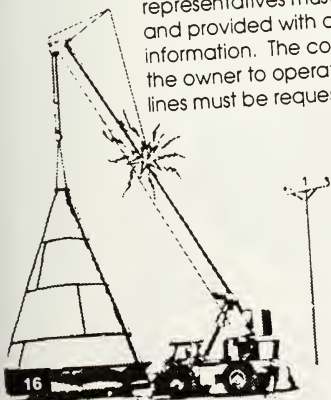
Power Line Clearances and the Law cont.

A person must be designated to observe clearance of the equipment and provide timely warnings for all operations where it is difficult for the operator to maintain the desired clearance visually.

Cage-type boom guards, insulating links or proximity warning devices may be used on cranes, but their use must not alter the requirements of any other regulation of this part even if such devices are required by law or regulation.

Any overhead wire must be considered energized unless and until appropriate authorities indicate that it is not energized and has been visibly grounded.

Before operations begin near electrical lines, the owners of the lines or their authorized representatives must be notified and provided with all pertinent information. The cooperation of the owner to operate near the lines must be requested.



Additional copies of this brochure may be obtained from Detroit Edison Corporate Safety and Health, 2000 Second Avenue, Room 110 SB, Detroit, MI 48226.



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or Working
Near Overhead
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Michigan, Call



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UTILITY COMMUNICATION SYSTEM

Kathleen A. Fournier
Executive Director

Headquarters: 1030 Featherstone Road
Pontiac, MI 48342-1830
(313) 332-3422

1-800-482-7171

(TOLL FREE)

MISS DIG is a convenient method for anyone who plans to excavate, tunnel, drill, bore, discharge explosives or demolish to meet their responsibilities under Michigan's law and Federal regulations by notifying the utilities prior to any planned excavation.

A public utility served with notice in accordance with the law, will identify their underground facilities using the following color code as stated in the law:

- Safety Red for electric
- Safety Yellow for gas, oil or dangerous material pipelines
- Safety Orange for telephone, telegraph, police & fire communications
- Safety Blue for water
- Safety Brown for cable TV
- Safety Green for sewer and storm drains

**BEFORE YOU DIG
CALL MISS DIG®**

1-800-482-7171
(TOLL FREE)



When planning work involving contact with equipment which could contain overhead electric lines, protective measures must be taken. This is to maintain clearances between wires and equipment per State and Federal Safety Standards as shown in the table below:

Voltage	Clearance With Boom Raised		Clearance in Transit With Boom Lowered and No Load	
	To			
50 kV	10'		4'	
69 kV	10'-7.6"		10'	
120 kV	12'-4.0"		10'	
138 kV	12'-11.2"		10'	
345 kV	19'-10.4"		10'	
765 kV	33'-10.0"		16'	

(Calculations based on Michigan Occupational Safety and Health Act, Construction Safety Rules, Part 10, Lifting and Digging Equipment)



**IF YOU CANNOT
MAINTAIN THESE
CLEARANCES OR YOU
ARE IN DOUBT, CALL
MISS DIG**

The participating electric utilities will dispatch, provided as a public service, a representative to meet you at the location specified.

The representative will check the electric lines in the vicinity of your work and advise you of the voltages involved.

IMPORTANT

In emergency situations such as water main breaks, gas leaks, water line repairs, utility line repairs, etc., MISS DIG can be called anytime, day or night. For this purpose, MISS DIG operates 24 hours.

Information regarding repairs, relocation of utilities, billing or other requests should be directed to the local utilities. These numbers are available in the local phone directories.

When you call (3 working days prior to beginning your work, 6 a.m. to 7 p.m. Monday thru Friday, except selected holidays), the following information must be supplied:

Phone _____ Company _____
 Caller _____
 County: _____ City, Twp or Vlg _____
 T _____ R _____ S _____
 Address _____
 Cross Streets: _____
 Type of Work _____
 Start Time & Date: _____

FIRES & WIRES



**Detroit
Edison**

Published in the interest of your safety by Detroit Edison
Additional copies of this brochure may be obtained by contacting Detroit Edison
Corporate Safety and Health, 2000 Second Avenue, Room 110 SB,
Detroit, Michigan 48226.

*Electrical Safety for Fire Fighters
and Other Emergency Personnel*

**Detroit
Edison**

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FIRES & WIRES

Introduction

The Michigan Fire Fighters Training Council requires that fire fighters have an understanding of the hazards of electricity and the proper way to handle electrical emergencies.

Detroit Edison has prepared this brochure to help you recognize such hazards, prevent accidents, cultivate protective work habits and train others in safe principles and procedures for fighting fires.

We remind you that only trained personnel, using specialized tools and equipment, should deal with electric equipment. However, your knowledge of safe work practices can mean the difference between life and death.

Contents:

- page **2** BASIC ELECTRICITY TERMS
AND CHARACTERISTICS
- 4** SAFE PRINCIPLES
AND PROCEDURES
- 6** ADDITIONAL SAFETY TIPS
TO REMEMBER
- 7** ELECTRICITY AND THE
HUMAN BODY
- 8** "SOMEONE'S TRAPPED..."

Basic Electricity Terms and Characteristics

A **conductor** is any material capable of transferring electricity. Metal, water, hoses, wet or damp ropes and wet wood conduct electricity.

Voltage is the pressure or force which causes the flow of electricity through a conductor. This force is measured in volts.

Current is the flow of electricity through a conductor. Current is measured in amperes.

Voltage and current can be likened to water pressure and water flow, respectively. And like water seeking to its lowest level, electricity always seeks the ground -- and will travel the shortest route through any conductive material to get to the ground. Insulating electricity with non-conductive materials or isolating it prevents electricity from going to ground.

Delivery of electricity to customers begins with **electric generation** at a power plant. **Transmission** lines move power at high voltage -- 365,000 volts in the eastern Michigan -- to stations, where power is stepped down. **Subtransmission** lines carry power between 24,000 and 70,000 volts to substations, where it is further reduced. From substations, power is conveyed over the **distribution system's primary lines** carrying either 4,800 or 13,200 volts and stepped down through pole-top or ground-mounted transformers to **secondary lines** conveying between 120 and 480 volts. **Service drops** carry power from the pole to individual customers.

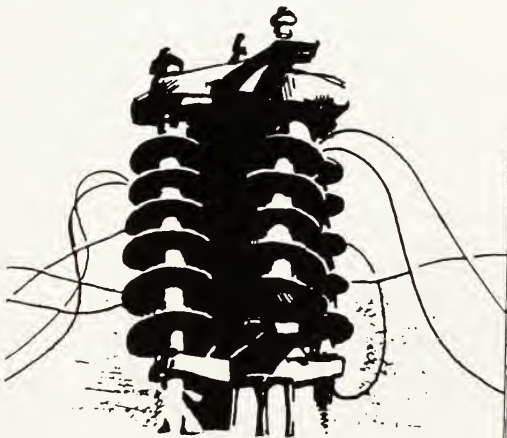
Primary lines are generally located on cross arms at the top of a wood pole, with secondary lines several feet below. In addition, telephone and cable television lines may be found on poles -- mounted below primary lines.

Electrical or "Class C" fires are generally fires of combustible materials ignited by overheated conductors and equipment or circuit failures.

Overheating occurs when the amount of current carried by the conductor or equipment exceeds its maximum rated design. Overloaded motors and other equipment account for the majority of overheating fires in electrical wires and equipment.

Class C fires may also result from an electric arc -- a jump of current over a gap in a conductor -- usually caused by a short circuit or a current interruption at a switch point, or by a loosely connected conductor.

Arcs are extremely hot and can readily ignite nearby combustible material -- including insulating material covering the conductor itself.



Safe Principles and Procedures

When you encounter an electrical hazard,
Call Detroit Edison immediately at
800-477-4747

When you call, you'll first hear "welcome to Detroit Edison customer service." After this message, enter your Personal Identification Number (PIN) as provided to you by Detroit Edison for then press the "#" symbol for immediate access to a customer telephone representative.

Report the hazard location by nearest address or by number of poles from the nearest intersection or street.

Report whether someone from your agency is guarding the hazard -- and if the hazard is wide spread or affects only one location or building.

Do not touch downed or sagging lines as energized and dangerous -- regardless of a "safe" appearance.

Never try to move a downed line. This is a job only for trained Detroit Edison personnel.

Treat a covered or insulated line as you would a bare line -- and treat all lines as "hot" until you have been informed by Detroit Edison personnel that they are de-energized.

Covering on lines is designed to protect the conductor from nicks and abrasions during installation. It is not designed to prevent electric shock.

Broken lines increase stress on the supporting poles on each side of the break, weakening adjacent line spans which may cause them to sag or fall.

Remember also that lines are frequently energized from both direction -- and that a break does not mean the line is isolated from a live circuit.

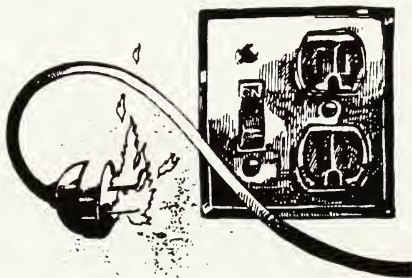
Do not approach emergency or fire apparatus vehicles carefully.

Don't park under overhead lines or adjacent to a line break, and be careful whenever a fire hose crosses under an overhead line. Fires can burn lines and drop them onto rescue vehicles and equipment. Hose lines are conductors!

- Don't drive across downed lines. Tire tread can grab and move lines unexpectedly -- and even cause them to come in contact with your vehicle.
- State law dictates that aerial equipment must clear overhead lines by at least 10 feet. Also, be wary of lines attached to residential and commercial buildings -- and keep ladders clear.

You are responsible for your own personal safety.

- Rubber boots, gloves, fire coats and jumpsuits are not designed to insulate the wearer from electrical hazards -- and should not be thought of as "protection".
- Don't risk your life by relying on "automatic" hazard annunciators or proximity warning devices designed to sound when vehicles or booms approach energized overhead lines or equipment.
- Be extremely careful when passing through darkened buildings, corridors or other areas where lines may be sagging or down on the floor or ground. Hold arms outstretched with palms toward your face. Should contact with an energized line occur, the body will react by contracting muscles inward, freeing you from the hazard.



Additional Safety Tips Remember

Overhead power lines which sag or fall onto communication lines, fences, vehicles or other objects can electrify and make these objects dangerous. Treat these objects as potential conductors. Don't jump onto or touch a rescue vehicle if you suspect it is touching a line. Remember from the first moment you arrive at a fire scene that water and hose streams are excellent conductors of electricity. First, adjust the nozzle to a fog pattern -- not a steady or pulsating stream of water. A safe distance for fog is 20 feet from the hazard. For a straight stream, keep at least 80 feet away. Don't flood an area where electric equipment is inspected, and never enter a flooded basement when the electric power is switched on. Conversely, don't cut power to a building unless it is absolutely necessary. Power may be needed to illuminate dark areas or operate pumps or other equipment conductors of electricity. First, adjust the nozzle to a fog pattern. If damage is so severe that electric service is no longer required, the total power supply to the building should be terminated. When it is necessary to cut power, try the circuit breaker panel first if safe access to it is possible. Position yourself to one side of the panel -- not directly in front of -- to guard against a possible arc explosion. Have your face shield in place and rubber gloves on. Electric meters are not switches. Pulling meters to disconnect power should be left to Detroit Edison personnel. When gas or flammable-liquid fumes are present or suspected, avoid operating any electrical switch which may spark and trigger an explosion. When power must be cut in such situations, it should be done at a location away from the explosive atmosphere. Don't remove a manhole cover from a smoking manhole or spray the manhole with water or any other extinguishing agent without direction from Detroit Edison or other authorized utility personnel. Don't enter substation property unless accompanied by Detroit Edison or other authorized utility personnel.

Electricity and the Human Body

Electric current may cause serious injury in two ways:

- Contact with an energized conductor can cause electric current to pass through the body to a grounded object, resulting in possible brain or organ damage, as well as serious burns.
- Exposure to heat and ultra-violet rays generated by an electric arc can cause both thermal burns to the body and flash burns to the eyes.

Duration of contact plays an important role in determining the effects of electric current on the human body. A small current which might not cause injury may cause muscles to contract and make the victim unable to "let go" of the live electricity source. The longer resulting contact may cause injury.

Electrical contact can:

- Throw the heart into random, uncoordinated spasms known as ventricular fibrillation.
- Cause involuntary muscle contractions violent enough to rupture muscle fiber and break bones.
- Contract chest muscles to a degree that causes suffocation.
- Temporarily paralyze the nerve center in the brain, which controls respiration. Paralysis often continues long after the victim is removed from the source of the current.
- Cause massive body tissue damage, depending on the amount of current involved.



Someone's Trapped..."

Someone is trapped inside a vehicle with an electrical fault touching the vehicle:

Don't touch the vehicle or its occupants. Rubber tires do not "ground" the vehicle or make it safe.

Instruct others to keep away. The vehicle and the area around it may be energized.

If there are no injuries, instruct the occupants to stay in the vehicle and remain inside until electric utility personnel de-energize or remove the line. Don't allow occupants to attempt reach out or remove the line. For reasons of safety or imminent danger, the occupants decide they must leave the vehicle, give them these directions to jump clear:

1. Open the door wide and stand on the door sill.

2. Jump as far as possible from the vehicle with feet together so that no parts of the body are in contact with the vehicle and the ground at the same time. Never lie down.

3. Shuffle slowly away from the affected area. Never take large steps after landing. Because there may be large voltage differences in the ground, it is possible for one foot to be in a high-voltage area and the other to be in a lower-voltage area. The difference between the two may kill.

Someone Has Contacted Electrified Equipment

Do not touch the person until the equipment is de-energized or the source of contact is broken. Don't risk your life unless there is a safe method to clear the contact.

Someone Cleared from Contact:

If the victim is unconscious and not breathing, begin artificial respiration immediately.

If a pulse can be felt, begin cardiopulmonary resuscitation (CPR) immediately. Seconds count!

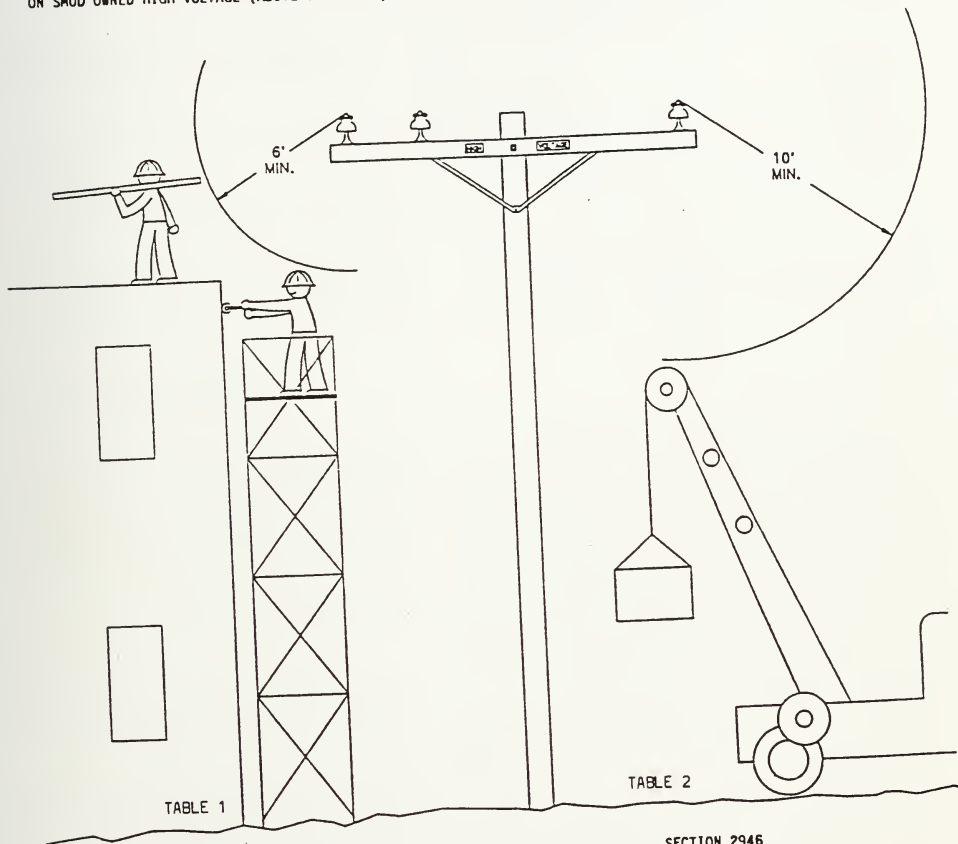
Electrical safety for fire fighters and other emergency personnel means balancing the risks of such jobs with knowledge for the active prevention of accidents.

The recommendations in this brochure are based on accepted fire fighting and utility practices -- and should be considered as general guidelines for your personal safety and the protection of others.

Because every emergency situation you enter is unique, your careful response can mean the difference between life and death.

CAL OSHA
 CALIFORNIA CODE OF REGULATIONS
 TITLE 8. INDUSTRIAL RELATIONS
 HIGH VOLTAGE ELECTRICAL SAFETY ORDERS
 ARTICLE 37. PROVISIONS FOR PREVENTING ACCIDENTS DUE TO PROXIMITY TO OVERHEAD
 LINES. SECTIONS 2946 & 2948

THESE CLEARANCES APPLY TO ALL PERSONS WHO ARE NOT QUALIFIED ELECTRICAL WORKERS, AUTHORIZED BY SMUD, TO WORK ON SMUD OWNED HIGH VOLTAGE (ABOVE 600 VOLTS) CONDUCTORS.



SECTION 2946

WORKERS OR OBJECTS NOT SUPPORTED BY BOOM TYPE EQUIPMENT MUST MAINTAIN 6 FEET CLEARANCE FROM HIGH VOLTAGE CONDUCTORS UP TO 50,000 VOLTS. ADDITIONAL CLEARANCE IS REQUIRED FOR HIGHER VOLTAGES.

SECTION 2948

BOOM TYPE LIFTING OR HOISTING EQUIPMENT MUST MAINTAIN 10 FEET CLEARANCE FROM HIGH VOLTAGE CONDUCTORS UP TO 50,000 VOLTS. ADDITIONAL CLEARANCE IS REQUIRED FOR HIGHER VOLTAGES.

SECTION 2948 REQUIRES THE PERSON RESPONSIBLE FOR THE WORK TO BE DONE, TO NOTIFY SMUD (CUSTOMER ESTIMATING DIVISION AT (916)732-5700) FOR AVAILABLE OPTIONS, IF THE REQUIRED CLEARANCES CANNOT BE MET, ACCORDING TO TITLE 8.

(j) Buildings which form part of an enclosure shall have no unguarded doors or windows which permit unintentional access to the enclosure. The enclosure is adjacent to and below stairways, fire escapes, balconies, or windows, suitable guards shall be installed to prevent persons making accidental contact with exposed energized parts.

(k) Work Space. Suitable work space shall be provided about exposed energized electrical equipment to permit the safe operation and/or maintenance of such equipment.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

Editorial correction of subsection (f) (4) filed 11-2-83 (Register 83, No. 45).
Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

Appendix A

Linemen's Body Belts, Safety Straps and Lanyards

The following requirements shall apply to all linemen's body belts, safety straps, and lanyards.

(1) All fabric used for safety straps shall withstand an A.C. dielectric of not less than 25,000 volts per foot "dry" for three minutes without visible deterioration.

(2) All fabric and leather used shall be tested for leakage current and all not exceed 1 milliampere when a potential of 3,000 volts is applied the electrodes positioned 12 inches apart.

(3) Direct current tests may be permitted in lieu of alternating current tests.

(4) The cushion part of the body belt shall:

(a) Contain no exposed rivets on the inside surface;

(b) Be at least three (3) inches in width;

(c) Be at least five thirty-seconds (5/32) inch thick, if made of leather; and

(d) Have pocket tabs that extended at least 1 1/2 inches down and three (3) inches back of the inside of circle of each D ring for riveting on plier tool pockets. On shifting D belts, this measurement for pocket tabs all be taken when the D ring section is centered.

(5) A maximum of four (4) tool loops shall be so situated on the body belt that four (4) inches of the body belt in the center of the back, measuring from D ring to D ring, shall be free of tool loops, and any other attachments.

(6) Suitable copper, steel or equivalent liners shall be used around bar D rings to prevent wear between these members and the leather or fabric enclosing them.

(7) All stitching shall be of a minimum 42-pound weight nylon or equivalent thread and shall be lock stitched. Stitching parallel to an edge shall not be less than three-sixteenths (3/16) inch from edge of narrowest member caught by the thread. The use of cross stitching on leather is prohibited.

(8) The keeper of snaphooks shall have a spring tension that will not allow the keeper to begin to open with a weight of 2 1/2 pounds or less, but the keeper of snaphooks shall begin to open with a weight of four (4) pounds, when the weight is supported on the keeper against the end of the nose.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Editorial correction of items (7) and (11) filed 11-2-83 (Register 83, No. 45).
2. Amendment filed 6-2-87; operative 7-2-87 (Register 87, No. 24).

Appendix B

LIVE LINE TOOLS

Insulated parts of Live Line Tools shall have manufacturers' certification to withstand the following minimum tests:

(1) 100,000 volts per foot of length for five minutes when the tool is made of fiberglass; or

(2) 75,000 volts per foot of length for three minutes when the tool is made of wood; or

(3) other tests equivalent to (1) or (2) above as appropriate.

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

Appendix C

PROTECTIVE EQUIPMENT

Rubber insulating equipment shall meet the provisions of the American National Standard ANSI/ASTM series, which is hereby incorporated by reference, as follows:

ITEM	STANDARD
Rubber Insulating Gloves	D-120-83a
Rubber Insulating Matting	D-178-81
Rubber Insulating Blankets	D-1048-81
Rubber Insulating Hoods	D-1049-83
Rubber Insulating Line Hose	D-1050-80
Rubber Insulating Sleeves	D-1051-81

NOTE: Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

Article 37. Provisions for Preventing Accidents Due to Proximity to Overhead Lines

(Formerly Article 86)

§ 2946. Provisions for Preventing Accidents Due to Proximity to Overhead Lines.

(a) General. No person, firm, or corporation, or agent of same, shall require or permit any employee to perform any function in proximity to energized high-voltage lines; to enter upon any land, building, or other premises and there engage in any excavation, demolition, construction, repair, or other operation; or to erect, install, operate, or store in or upon such premises any tools, machinery, equipment, materials, or structures (including scaffolding, house moving, well drilling, pile driving, or hoisting equipment) unless and until danger from accidental contact with said high-voltage lines has been effectively guarded against.

(b) Clearances or Safeguards Required. Except where overhead electrical distribution and transmission lines have been de-energized and visibly grounded, the following provisions shall be met:

(1) Over Lines. The operation, erection, or handling of tools, machinery, apparatus, supplies, or materials, or any part thereof, over energized overhead high-voltage lines shall be prohibited.

EXCEPTION: 1: Aircraft over energized overhead high-voltage lines operating in conformance with:

(A) Applicable regulations administered by the Federal Aviation Administration; and/or

(B) Helicopter Operations, Article 35, Construction Safety Orders, California Administrative Code, Title 8.

EXCEPTION 2: Tower cranes (Hammerhead) installed not closer than the minimum clearances set forth in Table 2, whereon the trolley or boom travel is controlled by limit switches which will prevent carrying a load over energized overhead high-voltage lines or within a horizontal distance closer than the minimum clearances set forth in Table 2.

(2) The operation, erection, handling, or transportation of tools, machinery, materials, structures, scaffolds, or the moving of any house or other building, or any other activity where any parts of the above or any part of an employee's body will come closer than the minimum clearances from energized overhead lines as set forth in Table 1 shall be prohibited.

Operation of boom-type equipment shall conform to the minimum clearances set forth in Table 2, except in transit where the boom is lowered and there is no load attached, in which case the distances specified in Table 1 shall apply.

TABLE 1

General Clearances Required from Energized Overhead High-Voltage Conductors

Nominal Voltage (Phase to Phase)	Minimum Required Clearance (Feet)
600 50,000	6
over 50,000 345,000	10
over 345,000 750,000	16
over 750,000 1,000,000	20

(3) Boom-type lifting or hoisting equipment. The erection, operation or dismantling of any boom-type lifting or hoisting equipment, or any part thereof, closer than the minimum clearances from energized overhead high-voltage lines set forth in Table 2 shall be prohibited.

(4) Storage. The storage of tools, machinery, equipment, supplies, materials, or apparatus under, by, or near energized overhead high-voltage lines is hereby expressly prohibited if at any time during such handling or other manipulation it is possible to bring such tools, machinery, equipment, supplies, materials, or apparatus, or any part thereof, closer than the minimum clearances from such lines as set forth in Table 1.

(c) The specified clearance shall not be reduced by movement due to any strains impressed (by attachments or otherwise) upon the structures supporting the overhead high-voltage line or upon any equipment, fixtures, or attachments thereon.

(d) Any overhead conductor shall be considered to be energized unless and until the person owning or operating such line verifies that the line is not energized, and the line is visibly grounded at the work site.

TABLE 2

Boom-type lifting or hoisting equipment clearances required from energized overhead high-voltage lines.

Nominal voltage (Phase to Phase)	Minimum Required Clearance (Feet)
600 50,000	10
over 50,000 75,000	11
over 75,000 125,000	13
over 125,000 175,000	15
over 175,000 250,000	17
over 250,000 370,000	21
over 370,000 550,000	27
over 550,000 1,000,000	42

NOTE. Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment of subsections (b), (c), repealer of subsections (d), (e) and new subsection (d) filed 8-9-79; effective thirtieth day thereafter (Register 79, No. 32).
2. Editorial correction renumbering former Article 86 to Article 37 filed 11-2-83 (Register 83, No. 45).
3. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

§ 2947. Warning Signs Required.

The owner, agent, or employer responsible for the operations of equipment shall post and maintain in plain view of the operator and driver on each crane, derrick, power shovel, drilling rig, hay loader, hay stacker, pile driver, or similar apparatus, a durable warning sign legible at 12 feet reading: "Unlawful To Operate This Equipment Within 10 Feet Of High-Voltage Lines of 50,000 Volts Or Less."

In addition to the above wording, the following statement in small lettering shall be provided on the warning sign: "For Minimum Clearances of High-Voltage Lines In Excess of 50,000 Volts, See California Code of Regulations, Title 8, Article 37, High-Voltage Electrical Safety Orders."

NOTE. Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Amendment filed 8-9-79; effective thirtieth day thereafter (Register 79, No. 32).
2. Editorial correction filed 11-2-83 (Register 83, No. 45).
3. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

§ 2948. Notification to the Operators of High-Voltage Lines and Responsibility for Safeguards.

When any operations are to be performed, tools or materials handled, or equipment is to be moved or operated within the specified clearances of any energized high-voltage lines, the person or persons responsible for the work to be done shall promptly notify the operator of the high-voltage line of the work to be performed and shall be responsible for the completion of the safety measures as required by Section 2946 (b) before proceeding with any work which would impair the aforesaid clearance.

NOTE. Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Editorial correction adding NOTE filed 11-2-83 (Register 83, No. 45).
2. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

§ 2949. Special Exemption.

The provisions of the foregoing Sections 2946 through 2948 shall not apply to the construction, reconstruction, maintenance, or operation of any energized overhead high-voltage lines or their supporting structures or appurtenances by qualified electrical workers, authorized by the owner of such lines, nor to work performed in proximity to energized overhead high-voltage lines by qualified persons using approved equipment and work procedures specified in these orders in accordance with Penal Code Section 385D.

NOTE. Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. Repealer and new section filed 8-9-79; effective thirtieth day thereafter (Register 79, No. 32).
2. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

Article 38. Line Clearance Tree Trimming Operations

(Formerly Article 87)

§ 2950. Application.

This article shall apply to all line clearance tree trimming operations performed in the vicinity of exposed energized overhead conductors and equipment where any part of the employee's body, tools or equipment being used, or parts of trees being worked upon, is likely to come within the distances specified in Section 2946(b)(2).

NOTE. Additional requirements for Tree Work, Maintenance or Removal, are contained in Article 12 of the General Industry Safety Orders, Title 8, California Administrative Code.

NOTE. Authority cited: Section 142.3, Labor Code. Reference: Section 142.3, Labor Code.

HISTORY

1. New Article 87 (§§ 2950-2959, not consecutive) filed 10-14-75 as an emergency; effective upon filing (Register 75, No. 42).
2. Certificate of Compliance as to Article 87, except for Sections 2950(c)(2)(A), 2954(f), and 2955(a)(5)(A) filed 1-9-76 (Register 76, No. 2).
3. Amendment of subsection (c)(2)(A) filed 1-9-76 (Register 76, No. 2).
4. Repealer of Article 87 (Sections 2950-2959, not consecutive) and new Article 87 (Sections 2950-2951) filed 8-9-79; effective thirtieth day thereafter (Register 79, No. 32).
5. Amendment filed 4-16-80 as procedural and organizational; effective upon filing (Register 80, No. 16).
6. Editorial correction renumbering former Article 87 to Article 38 filed 11-2-83 (Register 83, No. 45).
7. Amendment filed 12-10-87; operative 1-9-88 (Register 88, No. 1).

§ 2951. Line Clearance Operations.

(a) Prior to commencing line clearance tree trimming operations, the employer shall ensure that an inspection of the work locations is made in order to identify potential hazards and a tail gate briefing is conducted to discuss the work procedures to be followed.

(b) Only qualified line clearance tree trimmers, or trainees under the direct supervision and instruction of qualified line clearance tree trimmers, shall be permitted to perform line clearance tree trimming operations as described in Section 2950. Under no circumstances shall the

PENAL CODE 385

PUBLIC HEALTH AND SAFETY

385. Tools, machinery, cranes, power shovels, etc., near high voltage overhead conductors; offense; posting notices; exceptions

- (a) The term "high voltage" as used in this section means a voltage in excess of 750 volts, measured between conductors or measured between the conductor and the ground.

The term "overhead conductor" as used in this section means any electrical conductor (either bare or insulated) installed above the ground except such conductors as are enclosed in iron pipe or other metal covering of equal strength.

CRIMES AND PUNISHMENT

- (b) Any person who either personally or through an employee or agent, or as an employee or agent of another, operates, places, erects or moves any tools, machinery, equipment, material, building or structure within six feet of a high voltage overhead conductor is guilty of a misdemeanor.
- (c) It shall be a misdemeanor to own, operate or to employ any person to operate, any crane, derrick, power shovel, drilling rig, hay loader, hay stacker, pile driver, or similar apparatus, any part of which is capable of vertical, lateral or swinging motion, unless there is posted and maintained in plain view of the operator thereof, a durable warning sign legible at 12 feet, reading: "Unlawful to operate this equipment within six feet of high voltage lines."

Each day's failure to post or maintain such sign shall constitute a separate violation.

- (d) The provisions of this section shall not apply to (1) the construction, reconstruction, operation or maintenance of any high voltage overhead conductor, or its supporting structures or appurtenances by persons authorized by the owner, or (2) the operation of standard rail equipment which is normally used in the transportation of freight or passengers, or the operation of relief trains or other emergency railroad equipment by persons authorized by the owner, or (3) any construction, reconstruction, operation or maintenance of any overhead structures covered by the rules for overhead line construction prescribed by the Public Utilities Commission of the State of California.

APPENDIX F
DOCUMENTS PROVIDED BY MUNICIPALITIES

1989 SESSION
VIRGINIA ACTS OF ASSEMBLY - CHAPTER 341

An Act to amend and reenact § 40.1-49.4 of the Code of Virginia and to amend the Code of Virginia by adding in Title 59.1 a chapter numbered 30, consisting of sections numbered 59.1-406 through 59.1-414, to create the Overhead High Voltage Line Safety Act; penalties.

Newport News

[H 21]

Approved MAR 20 1989

Be it enacted by the General Assembly of Virginia:

1. That § 40.1-49.4 of the Code of Virginia is amended and reenacted and that the Code of Virginia is amended by adding in Title 59.1 a chapter numbered 30, consisting of sections numbered 59.1-406 through 59.1-414, as follows:

§ 40.1-49.4. Enforcement of this title and standards, rules or regulations for safety and health; orders of Commissioner; proceedings in district court; injunctions; penalties.—A. 1. If the Commissioner has reasonable cause to believe that an employer has violated any safety or health provision of Title 40.1 or any standard, rule or regulation adopted pursuant thereto, he shall with reasonable promptness issue a citation to the employer. Each citation shall be in writing and shall describe with particularity the nature of the violation or violations, including a reference to the provision of this title or the appropriate standards, rules or regulations adopted pursuant thereto, and shall include an order of abatement fixing a reasonable time for abatement of each violation.

2. The Commissioner may prescribe procedures for calling to the employer's attention de minimus violations which have no direct or immediate relationship to safety and health.

3. No citation may be issued under this section after the expiration of six months following the occurrence of any alleged violation.

4. (a) The Commissioner shall have the authority to propose civil penalties for cited violations in accordance with subsections G, H, I, and J of this section. In determining the amount of any proposed penalty he shall give due consideration to the appropriateness of the penalty with respect to the size of the business of the employer being charged, the gravity of the violation, the good faith of the employer, and the history of previous violations.

(b) After, or concurrent with, the issuance of a citation and order of abatement, and within a reasonable time after the termination of an inspection or investigation, the Commissioner shall notify the employer by certified mail or by personal service of the proposed penalty or that no penalty is being proposed. The proposed penalty shall be deemed to be the final order of the Commissioner and not subject to review by any court or agency unless, within fifteen working days from the date of receipt of such notice, the employer notifies the Commissioner in writing that he intends to contest the citation, order of abatement or the proposed penalty or the employee or representative of employees have filed a notice in accordance with subsection B of this section and any such notice of proposed penalty, citation or order of abatement shall so state.

B. Any employee or representative of employees of an employer to whom a citation and order of abatement has been issued may, within fifteen working days from the time of the receipt of the citation and order of abatement by the employer, notify the Commissioner, in writing, that they wish to contest the abatement time before the general district court.

C. If the Commissioner has reasonable cause to believe that an employer has failed to abate a violation for which a citation has been issued within the time period permitted for its abatement, which time shall not begin to run until the entry of a final order in the case of any contest as provided in subsection E of this section initiated by the employer in good faith and not solely for delay or avoidance of penalties, a citation for failure to abate will be issued to the employer in the same manner as prescribed by subsection A of this section. In addition, the Commissioner shall notify the employer by certified mail or by personal service of such failure and of the penalty proposed to be assessed by reason of such failure. If, within fifteen working days from the date of receipt of the notice of the proposed penalty, the employer fails to notify the Commissioner that he intends to contest the citation or proposed assessment of penalty, the citation and assessment as proposed shall be deemed a final order of the Commissioner and not subject to review by any court or agency.

D. Civil penalties owed under this section shall be paid to the Commissioner for deposit

into the general fund of the Treasurer of the Commonwealth. The Commissioner shall prescribe procedures for the payment of proposed assessments of penalties which are not contested by employers. Such procedures shall include provisions for an employer to consent to abatement of the alleged violation and pay a proposed penalty or a negotiated sum in lieu of such penalty without admission of any civil liability arising from such alleged violation.

Final orders of the Commissioner, the general district courts or the circuit courts may be recorded, enforced and satisfied as orders or decrees of a circuit court upon certification of such orders by the Commissioner or the court as appropriate.

E. Upon receipt of a notice of contest of a citation, proposed penalty, order of abatement or abatement time pursuant to subdivision A 4 (b), B or C of this section, the Commissioner shall immediately notify the Commonwealth's attorney for the jurisdiction wherein the violation is alleged to have occurred and upon issuance and service of a proper summons, the general district court shall promptly set the matter for hearing. The general district court shall thereafter issue a written order, based on findings of fact and conclusions of law, affirming, modifying or vacating the Commissioner's citation or proposed penalty, or directing other appropriate relief, and such order shall become final thirty days after its issuance. The general district court shall provide affected employees or their representatives and employers an opportunity to participate as parties to hearings under this subsection.

F. 1. In addition to the remedies set forth above, the Commissioner may file a bill of complaint with the clerk of any court having equity jurisdiction over the employer or the place of employment involved asking the court to temporarily or permanently enjoin any conditions or practices in any place of employment which are such that a danger exists which could reasonably be expected to cause death or serious physical harm immediately or before the imminence of such danger can be eliminated through the enforcement of procedures otherwise provided by this title. Any order issued under this section may require such steps to be taken as may be necessary to avoid, correct or remove such imminent danger and prohibit the employment or presence of any individual in locations or under conditions where such imminent danger exists, except individuals whose presence is necessary to avoid, correct or remove such imminent danger or to maintain the capacity of a continuous process operation to resume normal operations without a complete cessation of operations, or where a cessation of operations is necessary, to permit such to be accomplished in a safe and orderly manner. No order issued without prior notice to the employer shall be effective for more than five working days. Whenever and as soon as the Commissioner concludes that conditions or practices described in this subsection exist in any place of employment and that judicial relief shall be sought, he shall immediately inform the affected employer and employees of such proposed course of action.

2. Any court described in this section shall also have jurisdiction, upon petition of the Commissioner or his authorized representative, to enjoin any violations of this title or the standards, rules or regulations promulgated thereunder.

3. If the Commissioner arbitrarily or capriciously fails to seek relief under subdivision 1 of this subsection, any employee who may be injured by reason of such failure, or the representative of such employee, may bring an action against the Commissioner in a circuit court of competent jurisdiction for a writ of mandamus to compel the Commissioner to seek such an order and for such further relief as may be appropriate.

G. Any employer who has received a citation for a violation of any safety or health provision of Title 40.1 or any standard, rule or regulation promulgated pursuant thereto and such violation is specifically determined not to be of a serious nature may be assessed a civil penalty of up to \$1,000 for each such violation.

H. Any employer who has received a citation for a violation of any safety or health provision of Title 40.1 or any standard, rule or regulation promulgated pursuant thereto and such violation is determined to be a serious violation shall be assessed a civil penalty of up to \$1,000 for each such violation.

I. Any employer who fails to abate a violation for which a citation has been issued within the period permitted for its abatement (which period shall not begin to run until the entry of the final order of the general district court, if not appealed, or of the final order of the circuit court in the case of any appeal to that court initiated by the employer in good faith and not solely for delay or avoidance of penalties) may be assessed a civil penalty of not more than \$1,000 for each day during which such violation continues.

J. Any employer who willfully or repeatedly violates any safety or health provision of Title 40.1 or any standard, rule or regulation promulgated pursuant thereto may be assessed a civil penalty of not more than \$10,000 for each such violation.

K. Any employer who willfully violates any safety or health provisions of this title or standards, rules or regulations adopted pursuant thereto, and that violation causes death to any employee, shall, upon conviction, be punished by a fine of not more than \$10,000 or by imprisonment for not more than 6 months, or by both such fine and imprisonment. If the conviction is for a violation committed after a first conviction of such person, punishment shall be a fine of not more than \$20,000 or by imprisonment for not more than 1 year, or by both such fine and imprisonment.

L. 1. Notwithstanding the provisions of any other law, or any rule or regulation, there shall be no civil discovery by any party to a hearing or civil proceeding held pursuant to this section except as provided in this section.

2. In any proceeding before the general district court parties may obtain discovery by the methods provided for in the Rules of the Supreme Court of Virginia, Rules 4:1 and 4:3 through 4:13. The general district court may issue a protective order limiting discovery and setting deadlines for discovery.

3. In any proceeding before a judge of a circuit court parties may obtain discovery by the methods provided for in the Rules of the Supreme Court of Virginia.

M. No fees or costs shall be charged the Commonwealth by a court or any officer for or in connection with the filing of the complaint, pleadings, or other papers in any action authorized by this section or § 40.1-49.5.

N. Every official act of the general district court shall be entered of record and all hearings and records shall be open to the public, except any information subject to protection under the provisions of § 40.1-51.4:1.

O. An employer, or, upon entitlement to party status under subsection E of this section, an employee or a representative of employees may be represented in the general district court by a person who is not an attorney-at-law.

P. The provisions of Chapter 30 (§ 59.1-406 et seq.) of Title 59.1 shall be considered safety and health standards of the Commonwealth and enforced as to employers pursuant to this section by the Commissioner of Labor and Industry.

CHAPTER 30.

OVERHEAD HIGH VOLTAGE LINE SAFETY ACT.

§ 59.1-406. Scope.—This chapter (§ 59.1-406 et seq.) is enacted to promote the safety and protection of persons engaged in work or activity in the vicinity of overhead high voltage lines. The chapter defines the conditions under which work may be carried on safely and provides for the safety arrangements to be taken when any person engages in work or other activity in proximity to overhead high voltage lines.

§ 59.1-407. Definitions.—As used in this chapter:

"Covered equipment" means any mechanical equipment or hoisting equipment, any part of which is capable of vertical, lateral or swinging motion that could cause the equipment to be operated within ten feet of an overhead high voltage line, including but not limited to cranes, derricks, power shovels, drilling rigs, excavating equipment, hay loaders, hay stackers, combines, grain augers and mechanical cotton pickers.

"Overhead high voltage line" means all above ground bare or insulated electrical conductors of voltage in excess of 600 volts measured between conductors or measured between a conductor and the ground, except those conductors that are de-energized and grounded or that are enclosed in rigid metallic conduit or flexible armored conduit.

"Person" means natural person, firm, business association, company, partnership, corporation or other legal entity.

"Person responsible for the work to be done" means the person performing or controlling the job or activity.

"Warning sign" means a weather-resistant sign of not less than five inches by seven inches with a yellow background and black lettering reading as follows: "WARNING — UNLAWFUL TO OPERATE THIS EQUIPMENT WITHIN TEN FEET OF OVERHEAD HIGH VOLTAGE LINES" or such other equally effective warning signs as may be approved for use, by the Virginia Safety and Health Codes Board or the Commissioner of Labor and Industry.

§ 59.1-408. Prohibited activities.—Unless danger of contact with overhead high voltage lines has been guarded against as provided by § 59.1-410:

1. No person shall, individually or through an agent or employee, perform, or require any other person to perform, any work or activity upon any land, building, highway or other premises that will cause (i) such agent, employee or other person to be placed within six feet of any overhead high voltage line, or (ii) any part of any tool or material used by the agent, employee or other person to be brought within six feet of any overhead high voltage line.

2. No person shall, individually or through an agent or employee or as an agent or employee, operate any covered equipment within ten feet of any overhead high voltage line. This prohibition shall not apply, however, to covered equipment as defined herein when lawfully driven or transported on public streets and highways in compliance with the height restriction imposed by § 46.1-329 of this Code.

§ 59.1-409. Warning signs.—A. No person shall, individually or through an agent or employee, or as an agent or employee, operate any covered equipment in the proximity of an overhead high voltage line unless there is posted and maintained a warning sign placed as follows:

1. Within the equipment and readily visible and legible to the operator of such equipment when at the controls of such equipment; and

2. On the outside of equipment in such numbers and locations as to be readily visible and legible at twelve feet to other persons engaged in the work operations.

B. It shall be the duty and responsibility of the owner, lessee, or employer of any covered equipment to acquaint themselves and their employees who will be operating the equipment or will be engaged in the work operations with the provisions of this chapter and the regulations prescribed and promulgated pursuant to it.

§ 59.1-410. Temporary safety arrangements.—A. When any person desires to carry on any work or activity in closer proximity to any overhead high voltage line than permitted by this chapter, the person responsible for the work to be done shall notify the owner or operator of the high voltage line in the manner prescribed in § 59.1-411 at least forty-eight hours, excluding Saturday, Sunday and legal state and federal holidays, or in emergency situations, including police, fire and rescue emergencies, as soon as possible under the circumstances, prior to the time work is to be commenced. The work shall be performed only after satisfactory mutual arrangements have been negotiated between the owner or the operator of the lines or both and the person responsible for the work to be done. The negotiations shall proceed promptly and in good faith with the goal of accommodating the requested work consistent with the owner's or operator's service needs and the duty to protect the public from the danger of overhead high voltage lines. The owner or operator of the lines shall initiate the agreed upon safety arrangements within five working days and shall complete the work promptly and without interruption, consistent with the owner's or operator's service needs. Arrangements may include (i) placement of temporary mechanical barriers separating and preventing contact between material, equipment, or persons and overhead high voltage lines, (ii) temporary de-energization and grounding, (iii) temporary relocation or raising of the lines, or (iv) other such measures found to be appropriate in the judgment of the owner or operator of the lines.

B. The actual expense incurred by any owner or operator of overhead high voltage lines in taking precautionary measures as set out in subsection A of this section, including the wages of its workers involved in making safety arrangements, shall be paid by the person responsible for the work to be done.

§ 59.1-411. Notification—requirements.—A. Every notice served by any person on an owner or operator of an overhead high voltage line pursuant to § 59.1-410 shall contain the following information:

1. The name of the individual serving such notice;
2. The location of the proposed work;
3. The name, address and telephone number of the person responsible for the work;
4. The telephone number at the site of such work, if one is available;
5. The type and extent of the proposed work;
6. The name of the person for whom the proposed work is being performed;
7. The time and date of the notice; and
8. The approximate date and time when the work is to begin.

B. If the notification required by this chapter is made by telephone, a record of such notification shall be maintained by the owner or operator notified and the person giving the notice to document compliance with the requirements of this chapter.

C. To facilitate the notification required by this chapter, every owner and operator of overhead high voltage lines shall file with the clerk of the circuit court of each county and city in which its lines are located the address and telephone numbers of the person or office, in the Commonwealth, to whom all notifications concerning proposed work in that county or city should be directed. Such information shall be maintained by the clerk in his office in a manner to be determined at his discretion. The clerk of the circuit court with whom the information required by this section is filed shall be entitled to a fee of two dollars per page of any documents filed.

§ 59.1-412. Enforcement of chapter.—The provisions of this chapter shall be considered

as safety and health standards of the Commonwealth and enforced as to employers pursuant to § 40.1-49.4 of the Code of Virginia by the Commissioner of Labor and Industry.

In the case of violations of this chapter over which the Commissioner of Labor and Industry does not have enforcement powers pursuant to § 40.1-49.4 of the Code of Virginia, a civil penalty of up to \$1,000 may be imposed at the discretion of the general district court for the jurisdiction in which the offense occurred.

§ 59.1-413. *Exemptions.*—This chapter shall not apply to the construction, reconstruction, operation, and maintenance of overhead electrical or communication circuits or conductors and their supporting structures and associated equipment of (i) rail transportation systems, (ii) electrical generating, transmission or distribution systems, (iii) communication systems, including cable television, or (iv) any other publicly or privately owned system provided that such work on any of the foregoing systems is performed by the employees of the owner or operator of the systems or independent contractors engaged on behalf of the owner or operator of the system to perform the work.

This chapter also shall not apply to electrical or communications circuits or conductors on the premises of coal or other mines which are subject to the provisions of the Federal Mine Safety and Health Act of 1977 (30 U.S.C. § 801 et seq.) and regulations adopted pursuant to that Act by the Mine Safety and Health Administration.

§ 59.1-414. *Application.*—Except in conjunction with the enforcement of and in accordance with this chapter or an action by an owner or operator of an overhead high voltage power line to recover the cost of temporary safety arrangements or for damage to its facilities as provided for in this chapter, the provisions of this chapter shall not be construed either to abrogate or diminish any rights, duties, defenses or remedies existing under law or to create or expand any rights, duties, defenses or remedies in addition to rights, duties, defenses or remedies existing under law, nor shall any violation of this chapter constitute negligence per se in any civil action.

President of the Senate

Speaker of the House of Delegates

Approved:

Governor

APPENDIX G

"Other" Responses to: "What contract requirements have been stipulated on some past contracts to address the hazards posed by the presence of overhead power lines?" (Table 11)

APPENDIX G

Actual "Other" Responses to: "What contract requirements have been stipulated on some past contracts to address the hazards posed by the presence of overhead power lines?" (Table 11)

- "The items checked above have never been required by the owner-but is regularly required by our company."
- "Using insulating blankets on power lines."
- "Supplemental safety specifications not used for this exposure. Standard general terms require compliance with OSHA regulations."
- "None by contract."
- "Rubbering up the power lines with rubber insulators."
- "Install new line in another area ahead of normal schedule to facilitate deenergizing existing line."
- "Rubber lines."
- "Signing."
- "Assign lookout responsibility, require an individual be designated."
- "Mark line on ground 10' from lines. No work inside area."
- "Most utilities refuse to do this-recently." (Referring to installing barrier cables parallel to the overhead power lines.)
- "Permit requirements."
- "A minimum of 10' buffer space is maintained at all times. If that is not possible, the lines are either re-located, or de-energized."
- "Blanket."
- "Maintaining minimum clearances from lines."
- "This item usually is not addressed. We are required to follow all OSHA Regulations that apply."
- "Warning signs at locations where overhead lines cross roadways, orange warning balls placed on lines."
- "I have never seen contract language relative to overhead lines."
- "Generally these hazards are not specifically addressed in contract documents."
- "Comply with all city ordinances and federal regulations."

APPENDIX H

"Other" Responses to:"What ways has the company used to avoid worker contact with overhead power lines?" (Table 12)

APPENDIX H

Actual "Other" Responses to: "What ways has the company used to avoid worker contact with overhead power lines?" (Table 12)

- "Signage - Overhead Power Lines, Danger - High Voltage etc."
- "Using insulating devices on overhead power lines."
- "Signs installed at operator level on power poles."
- "Routing crane and equipment access away from power lines; coordinating crane locations; restricting swing radius."
- "Rubber up the lines."
- "Insulating protective covers (blankets) on power lines."
- "Production sequence by area."
- "Rubber lines."
- "Marking lines w/ flagging."
- "Signs & flagging."
- "Maintain Clearances."
- "Assign lookout responsibilities."
- "Spotters."
- "Crane operator licensing same accountability as described above - operator terminated - this works - probably not the text book approach." (This is referring to an internal procedure that restricts any operation closer than 10'. Any project that violates this procedure, the project manager is fired.)
- "On some projects we use a permit system when moving high clearance equipment."
- "Warning signs."
- "Blanket"
- "Having utilities sleeved, maintaining minimum clearances from lines."
- "Warning signs at locations where overhead lines cross roadways, orange warning balls placed on lines. Modify construction plan."
- "Using swing blocks to prevent crane house rotations."

APPENDIX H cont.

Actual "Other" Responses to: "What ways has the company used to avoid worker contact with overhead power lines?" (Table 12)

- "Insulate power lines."
- "Faraday cages - to dissipate static electric fields from crane loads close to energized lines. Lift lines up with insulated poles so equipment can pass or work under."

APPENDIX I

Actual Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

APPENDIX I

Actual Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

- "See attached." [This is a utility injury prevention and damage control plan. Document is contained in Appendix J.]
- "(1) Use of Spotter; (2) Written proximity permit; (3) Line warning devices-orange balls, flags; (4) Height gauge poles for reference; (5) Specific training of operators; (6) Request to de-energize."
- "Site specific orientations, warning signs and job task analysis prior to entering and working around overhead power lines."
- "A specific checklist item that is covered in the pre-construction meeting. See item #17 on attached." [For details see Appendix J.]
- "We hold each subcontractor accountable to CFR 29 Part 1926.550 (a) (15) (i) (ii) (iii)."
- "I.D. the lines and post visual warning signs; train our operators; try and get the lines relocated or placed underground; disconnect the power lines."
- "(1) Try to disconnect power during working hours; (2) If #1 is not possible, then install barriers; (3) Planning crane operations-location, swing radius,etc.; (4) Operator training and orientation to job site."
- "(1) De-energize or reroute lines if possible; (2) Mark lines where they are highly visible; (3) Station a flag person at routes where equipment intersects lines; (4) Ensure that all equipment operators are aware of hazards."
- "Place warning signs and flags, shunt power if possible, blanket lines."
- "Each job is different, however operator and signal men are instructed to stay away from power lines. We plan lifts with craft personnel."
- "Safety meetings (both pre job and onsite) to review with the crane company and trades the precautions necessary to prevent injury and damage. The local utility may also be called in for advice."
- "As a general contractor, our project team would identify the critical activity during the creation of the project safety plan. A safety planning meeting, with the affected subcontractors, would be coordinated by us and at that time (at the meeting) we would jointly agree on a consensus action plan. The subs with workers at risk would likely decide how to address (the hazard) pending our review."
- "(1) Shut off power if possible; (2) Relocate if practical; (3) Limit access by placing warning lines more distant than required by OSHA and/or limit boom length or position of crane to minimize the chance of an accidental swing into power lines."

APPENDIX I cont.

Actual Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

- "Pre-planning conference; safety task analysis; supervisors training; on site safety representative."
- "Initiate construction plan to avoid overhead activity in this area."
- "Contact utility company well in advance to 'relocate'. However, this should be in the contract documents and the owner's responsibility. Usually the power lines are at the perimeter, where this occurs flagging and high visibility warnings are used. Additionally, safety meetings, training conducted and additional measures listed below." [referring to remaining survey questions]
- "Hazard will be discussed with owner. Lines will be re-located or work will not be permitted directly beneath lines with consideration being given to the potential of contact or damage."
- "We notify the employees of their location. Hang caution tape from the lines. Have power company install insulating blankets when close work is required."
- "Brief all subcontractors, with tool box topics, pre-con meetings, request foreman to hold special safety meetings."
- "We call the power company. They will either sleeve the lines or shut them off."
- "Try to work on opposite side of site (tank)."
- "We will have utility company move or protect lines with insulating blankets; signage; flagging and operator training."
- "(1) Attempt to get lines moved; (2) de-energized; (3) conduct work away from lines with physical postings and employee instruction; (4) Analyze work near, under or passing by and install a system of posting, instruction, spotters, and physical flag/tunnel arrangement for routine passage."
- "Most of our contracts are cost plus. It would not be uncommon to relocate the power lines."
- "Contact utility owner to relocate or cover."
- "(1) Attempt to have lines moved or buried; (2) If not possible, mark lines; (3) Provide parallel guard cables and or insulating barriers."
- "Worker training / barricades."
- "Planning and scheduling is conducted on all phases of construction work and this has nothing to do with the contract."

APPENDIX I cont.

Actual Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

- "(1) De-energize if possible; (2) Relocate if possible; (3) Post warning signs and line elevation signs; (4) Post high visibility flags at line intersection; (5) Avoid setting up yards etc. in vicinity of lines; (6) Safety meeting subject; (7) Bury if possible."
- "Maintain OSHA standard of clearances, alert employees through training meetings."
- "Always require compliance with OSHA regulations, etc. We have regular pre planning, look ahead meetings. We practice hazard analysis to identify these exposures."
- "Limited access area enter with permit only. Will barricade area of limited access. Disconnect power."
- "Contact Commonwealth Edison to cover the lines to avoid direct contact."
- "Address situation in preconstruction meeting with own people and subs. Address situation and weekly safety meeting. Investigate having lines moved. Put protective rubbers on lines in area of prolonged activity."
- "OSHA regulations require minimum clearances. We adhere to these regulations. If minimum clearance cannot be maintained, operation is shut down."
- "The lines would be marked with hanging banners initially so they are easily seen by the operators. When work was being conducted around them, we would provide a spotter to ensure that the operator stayed a minimum 10' away. If the machine needed to be closer, then we would have the lines temporarily de-energized."
- "Our company follows regulatory guidelines re: signage, training, scheduling, and employee awareness."
- "Hold on-site safety meetings addressing any hazard that may occur on site."
- "(1) Try to reroute the power lines; (2) Ground the lines for that part of the project; (3) Move the lines on the pole away from the project; (4) Flag and mark lines in air and on the ground."
- "Company has an internal procedure that prohibits any operation closer than 10'. Any project that violates this procedure results in project manager being terminated. Procedure establishes alternatives for operation that require regional manager, safety manager approval."
- "Comply with OSHA regulations > 10' from lines."
- "Include procedures in site specific safety plan. Training operators on safety rules. Examine for hazards the routes prior to movement of equipment. If lines are to be crossed, provide supervisory escort. When possible disconnect power to lines when working in vicinity of lines."

APPENDIX I cont.

Actual Responses to: "Suppose your firm is working on a project where overhead power lines cross a portion of the construction site. The construction project will involve using mobile equipment that could come in contact with the overhead lines. How is your firm likely to address this situation if there is nothing specifically required in the contract documents?"

- "Our safety program is always referenced in contract documents. Within our safety program it states that mobile equipment will not be operated 'under any circumstances' within 10 ft of energized electrical lines (<50 kv) +.4 in per kv over 50 kv.
- "Insure that a 10' buffer space is maintained. If that is not possible, re-routing of mobile equipment would occur, with hazard warning signs posted throughout the affected area. Employee training would also address the situation."
- "De-energize lines, sleeve lines (blanket) or work safe distances."
- "Our safety program addresses this issue as part of the pre-project safety analysis. Then proper training and/or safeguards are instituted per our safety program guidelines."
- "Meet with representative of the utility to have lines de-energized. Mark overhead lines with orange balls or other material. Cover portions of the line to insulate against contact. Train all operating engineers concerning work near energized lines."
- "Topic for Operating Engineer Safety meetings; Modify construction plan to assure proper clearances; Warning devices such as signs and orange balls; Use underground circuits for all temporary feeders."
- "Disconnect power; Wrap lines; Other alternatives."
- "First choice - Have line moved or placed underground; Second choice - Have line de-energized during peak exposure periods; Third choice - Shield the line; Fourth choice - Use signs and other devices to draw attention to the line."
- "Raise or reroute the lines. Install warning balls on lines at road crossings."
- "We always perform a pre-job safety plan which identifies electric hazards; we have and will continue to use those items in question #5, many times in conjunction with the local power company."
- "No material stored under lines. Lines to be de-energized during work processes that puts mobile equipment within 15' of lines. Lines visually marked with orange engineering ribbon and signs posted on ground warning of overhead lines - tool box meetings to discuss overhead lines."
- "Notify subcontractors in writing of condition. Have on-site meeting with power company to establish procedures."

APPENDIX J
DOCUMENTS PROVIDED BY CONTRACTORS

UTILITY INJURY PREVENTION
AND
DAMAGE CONTROL PLAN

12-15-92

Electricity and flammable gases have long been recognized as serious workplace hazards, exposing employees to such dangers as electric shock, electrocution, burns, fires and explosions. Prior to any work performed where electrical distribution lines (overhead or underground) or other underground utilities are located, the following plan must be implemented:

Select
One:

_____ Option A:

Electrical distribution lines have been de-energized and visibly grounded at point of work.

Owner certification: _____

Tags must be placed on controls that are to be deactivated during the course of work on energized or deenergized equipment or circuits. Equipment or circuits that are deenergized must be rendered inoperative and have tags attached at all points where such equipment or circuits can be energized.

_____ Option B:

Insulating barriers, not a part of an attachment to the equipment or machinery, have been erected to prevent physical contact with the lines.

_____ Option C:

Equipment or machines shall be operated proximate to power lines only in accordance with the following:

1) For lines rated 50 kV. or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.

2) For lines rated over 50 kV., minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV. over 50 kV., or twice the length of the line insulator, but never less than 10 feet.

3) In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV., and 10 feet for voltages over 50 kV., up to and including 345 kV., and 16 feet for voltages up to and including 750 kV.

4) A person shall be designated to observe clearance of the equipment and give timely warning for all operations where it is difficult for the operator to maintain the desired clearance by visual means.

The superintendent shall post and maintain proper warning signs where such a circuit exists. The superintendent shall advise employees of the location of such lines, the hazards involved, and the protective measures to be taken. Warning signs may be obtained through the Safety Dept.

Additional precautions include:

5) Cage-type boom guards, insulating links, or proximity warning devices may be used on cranes, but the use of such devices shall not alter the requirements of any other regulation of this part even if such device is required by law or regulation.

6) Any overhead wire shall be considered to be an energized line unless and until the person owning such line or the electrical utility authorities indicate that it is not an energized line and it has been visibly grounded.

7) Prior to work near transmitter towers where an electrical charge can be induced in the equipment or materials being handled, the transmitter shall be de-energized or tests shall be made to determine if electrical charge is induced on the crane. The following precautions shall be taken when necessary to dissipate induced voltages:

W A R N I N G

THE ORIGINAL SIGNED COPY OF THE UTILITY INJURY PREVENTION AND DAMAGE CONTROL PLAN MUST BE SUBMITTED TO THE CORPORATE SAFETY DIRECTOR PRIOR TO STARTING WORK. FAILURE TO SUBMIT AND/OR IMPLEMENT THE PLAN WILL RESULT IN DISCIPLINARY ACTION TO INCLUDE DISMISSAL.

Project: _____

Job #: _____ Start Date: _____

Utility Types and Locations: _____

Date: _____

Superintendent

Date: _____

Project Manager

Date: _____

Equipment Operator

Date: _____

Reviewed by:

a) The equipment shall be provided with an electrical ground directly to the upper rotating structure supporting the boom.

b) Ground jumper cables shall be attached to materials being handled by boom equipment when electrical charge is induced while working near energized transmitters. Crews shall be provided with nonconductive poles having large alligator clips or other similar protection to attach the ground cable to the load.

Underground Utilities

A) Prior to jack hammering, drilling, trenching, excavating or any other underground construction activity, efforts shall be made to determine the location of dangerous underground utilities. Work shall be performed in a manner designed to prevent exposure of employees to hazards and damage to underground utilities.

Where the exact location of underground electric powerlines is unknown, employees using jack hammers or hand tools that may contact a line must be provided with insulated protective gloves. The superintendent is required to advise employees of the location of such lines, the hazards involved, and protective measures to be taken, as well as to post and maintain proper warning signs.

B) When underground utilities are exposed (electrical, gas, water, telephone, etc.), they shall be protected as necessary to avoid damage.

Any underground utility shall be considered on line or energized unless and until the person owning such line or the utility authorities indicate that the utility is not on line or energized. Such indication must be documented.



UTILITY INTERFERENCE PROCEDURE

	DATE	BY WHOM
Utility Company Notified 48 Hours Notice Person _____ Company _____		
Barricades 10 FT from poles, guy wires, etc. 3 Sides Minimum _____		
Stop sign pole with maximum boom height for area marked on pole. One at every entry/exit for machinery access to area.		
Signs in Place: "DANGER HIGH VOLTAGE OVERHEAD" Encircling danger area must be visible from 200 feet.		
1. Spotter Name _____ Date _____ Time In _____ Time Out _____ Red Vest On _____ Understand Responsibilities _____ Operational Horn in Possession _____		
2. Spotter Name _____ Date _____ Time In _____ Time Out _____ Red Vest On _____ Understand Responsibilities _____ Operational Horn in Possession _____		
3. Spotter Name _____ Date _____ Time In _____ Time Out _____ Red Vest On _____ Understand Responsibilities _____ Operational Horn in Possession _____		

Understand Responsibilities _____

Operational Horn in Possession _____

Spotter Name _____

Date _____ Time In _____ Time Out _____

Red Vest On _____

Understand Responsibilities _____

Operational Horn in Possession _____

Spotter Name _____

Date _____ Time In _____ Time Out _____

Red Vest On _____

Understand Responsibilities _____

Operational Horn in Possession _____

CORPORATE OFFICE: 40185 Routt County Road 129 • PO Box 774848 Steamboat Springs, Colorado 80477 • 303-879-2561 • fax 303-879-6078

UTILITY COMPANY REPRESENTATIVE

PIC REPRESENTATIVE

COMMENTS: _____

TASK MEETING FOR WORK WHICH
DIRECTLY INVOLVES OVERHEAD UTILITIES

CATION _____ I.E. STATIONING

RK ACTIVITIES _____

FIRST CASE SURFACE TO WIRE DISTANCE _____ FT.

DISCUSSION INCLUDED

- POSITIONING OF SPOTTERS
- SIGNS IN PLACE
- BARRICADES IN PLACE
- CABLE MARKED IF APPLICABLE
- MACHINERY TRAVEL SPEED

TIC SAFETY MANAGER _____

TIC SUPERVISOR _____

TPC REPRESENTATIVE _____

CREW

NAME

POSITION

SIGNATURE

TIC The Industrial Company**EXISTING UTILITY LOCATE
PROCEDURE**

	DATE	BY WHOM
1. Contact Utility Co./or Business which applies per utility locate schedule (48hr advance notice required).		
2. Review drawing on given distance from base line and approximate cover depth.		
3. Collect required tools and material: A. Line Locator B. Hand Probe C. Shovels D. Support Pole and Straps E. Safety Equipment: Splash goggles, gas mask, gas sniffer, fire extinguisher, radio contact with first aid.		
4. Obtain & complete excavation permit when excavating with-in FPC Operating Facility.		
5. With utility representative present and above items complete, start excavation <u>AT NO TIME SHALL MACHINERY CUT OR DIG WITHIN 3' OF UTILITIES.</u> Complete excavation with manpower.		
6. After sufficient exposure of existing utilities is completed, secure area with red barricade tape and reflective candle posts.		
7. Temporary support of existing utility is in place and approved.		
8. Make as-built location of dimensions & elevations. Transfer information to master drawings.		
9. Check for cathodic protection requirements.		

UTILITY COMPANY REPRESENTATIVE

FPC REPRESENTATIVE

TIC REPRESENTATIVE

COMMENTS:

DILLINGHAM CONSTRUCTION
PRE-JOB SAFETY CHECKLIST

1. Permits and notification
a. Construction & Scaffold permit when over 36 feet. *20' deep storm drain done by sub Lark*
b. Trenching permit when over 5 feet deep.
c. Demolition permit when razing.
d. Tower crane erection / dismantling.
e. Engineering drawings on site when required.
f. Notify subs that permits are required for their work.
2. Project duration / manpower
a. Size of project.
b. Manpower, Dillingham
c. Manpower, subcontractors
d. Start date 4-12-12 *487 days*
e. Completion date _____
3. Designated Safety Person and First Aid Qualifications *Alex*
a. Designate knowledgeable person as IIPP Administrator.
b. All Superintendents and foreman must have FA training.
c. Use company Risk Management Department for information.
d. Use Cal-OSHA consultants for information and advice.
4. Sanitation and security
a. Adequate chemical toilets available. ✓
b. Security service provided when necessary. Who? ✓
c. Who provides fences, public walkways and supply locks? ✓
d. Signs posted where needed for people and equipment. ✓
e. Emergency numbers- police, fire department and owner. ✓
5. Confined spaces, lockout procedures and GFCI's
a. Written and enforced confined space program needed?
b. Who will enforce, train and provide lockouts.
c. All 20 amp temporary power protected by GFCI's. ✓
d. Who will maintain temporary power? *Dillingham / crew site*
6. Erection plan, tower crane
a. Obtain erection plan from erection subcontractor.
b. Permanent floor within 8, fully bolted within 4.
c. Who will get permit?
d. Crane certificates on file with permits.
7. Overtime, night work, Illumination *some night work*
a. Is overtime expected. — *some night work*
b. Are lights needed? Who will provide and maintain?
c. Emergency services - arranged for late hours. —
d. Adjust safety procedures for 2nd shift work.
8. Flagmen, detours, dust control, pilot cars: *for unloading not on street*
signs, vests and barricades available?
9. Medical services, emergency and fire protection

- b. Have written emergency and fire procedures.
 - c. Post emergency phone numbers.
 - d. Have enough of proper fire fighting equipment.
 - e. Properly store any flammable materials.
 - f. Have eye wash station near caustic materials.
10. Adjacent property, business interruption, project access
11. Safety forms, safety / training file, bulletin board
- a. Site camera available.
 - b. File safety minutes, accident reports, job surveys.
 - c. Have complete bulletin board
 - d. Cal-OSHA log forms on file.
 - e. Read division's Injury and Illness Prevention Program
 - f. Operations code- new employees read and sign.
12. Safety meetings and training
- a. When will meetings be held?
 - b. Competent person or special training needed?
 - c. Document all training and/or exposures.
13. Accident investigation, incident reports and photos
- a. Who will make accident and incident reports?
 - b. Forward copies to Risk Management Department.
 - c. Subcontractors provide accident reports.
14. Cleanup responsibilities
- a. Who is responsible for cleanup?
 - b. Backcharge if necessary.
15. Trenching and excavation
- a. Are trenches over 5 feet deep expected?
 - b. Who will be performing actual trench work?
 - c. Alternate shoring systems require engineer's drawings.
 - d. Who will provide permit or notification?
 - e. Who is the "competent person"?
 - f. Copy of excavation / trenching rules on jobsite?
16. IIPP manual, Safety Orders, MSDS binder all on-site?
17. Soil conditions, underground / overhead utilities
- a. Are all known?
 - b. Who is responsible for interruptions?
 - c. Safe clearances to high voltage lines?
18. Hazard communication information
- a. Make a list of substances on site.
 - b. Get MSDS's for all items on list.
 - c. Require MSDS's from subcontractors.
 - d. Document Hazcomm/MSDS training.

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